MASTER'S THESIS

Examining the effects of IT capabilities and knowledge processes on agility in a healthcare setting

The effects of IT and knowledge processes on patient agility

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Abstract

Information technology is often considered to be a key enabler of capabilities such as knowledge-enabled processes and an organization's agility. IT infrastructure integration is known to support digital capabilities as well as support customer-centric response. Other studies show that knowledge processes and capabilities support customer response capabilities and indirectly, customer performance. This study, however, will focus on a healthcare setting rather than business organizations in general, as these organizations rely on the tacit knowledge of healthcare practitioners, which makes (IT-enabled) knowledge processes all the more important to serve a patient's needs adequately. A premise is developed that IT capabilities not only directly influence the degree to which a hospital can properly sense and respond to a patient's needs, but that patient knowledge processes also mediate this effect. A survey is carried out to perform an empirical examination of these relations. The results of this examination show that the direct effect of IT capabilities on a hospital's patient agility is rather weak, but that there is a strong mediated effect through patient knowledge processes. These findings are in contrast with the extant literature and provide new insight into the relationship between IT capabilities, knowledge processes and organizational agility.

Key terms

IT capability, knowledge capability, patient agility, healthcare, dynamic capabilities

Summary

In this study, the relations between IT Capabilities (ITC), Patient Knowledge Processes (PKP) and Patient Agility (PA) are examined. IT Capabilities are a reflection of how well an organization handles and deploys its IT infrastructure. It is the organization's technical and managerial skills concerning IT, which includes the proficiency to leverage IT systems as well as all the skills necessary to successfully implement an IT system. Patient Knowledge Processes are an organization's ability to generate, analyze and disseminate patient-related information for the purpose of strategy development and implementation. Finally, Patient Agility is an organization's ability to sense and respond to new patient-based opportunities. The latter is defined as a second order construct, which consists of the first order constructs of sensing and responding. Based on the extant literature, it is theorized that ITC is an antecedent for both PA as well as PKP. The latter however, is also considered to be a mediating factor between ITC and PA.

In order to operationalize these constructs, items and definitions from previous studies will be used to create a survey with which hospitals will be contacted. The unit of measurement will be at the department level as leaders of departments will most likely have the required knowledge and experience, although there will be no restriction to the occupation of a respondent. Aside from the items with which the constructs will be measured, several control variables will also be added to check for data quality. The resulting dataset of 108 responses, gathered in LimeSurvey and imported into SmartPLS 3, is then analyzed using PLS-SEM.

Before moving on to the PLS-SEM-based analyses, the data quality is assessed. The respondents appear to have adequate levels of experience and are mainly employed in mid-level management. The majority of the respondents work for university medical centers and top clinical hospitals, which account for only 23,4% of all hospitals in the Netherlands. This may indicate selection bias, but a *t* test between the hospital types shows that this does not lead to significant differences in the dataset. Furthermore, there was no non-response bias in de indicators, there was no skewness in the data and only a slight excess kurtosis for a few of the indicators.

Following the data examination, a factor analysis was carried out to check whether all constructs were correctly defined as first or second order constructs. All results confirmed the previously established model specification. Internal consistency is good, though slightly too high, as Composite Reliability is very close to the upper threshold. However, considering the values of Cronbach's Alpha, internal consistency is sufficiently below the critical level. The outer loadings meet the minimum value and the values of Average Variance Extracted are well above minimum levels, meaning that all constructs explain more than 50% of the indicators, establishing convergent validity. Finally, the model was assessed using the Fornell-Larcker criterion, cross-loadings and the Heterotrait-Monotrait ratio (HTMT), none of which proved problematic. Thus, discriminant validity is established, which is the final step in assessing the measurement model.

To start analysing the structural model, it is checked for collinearity. The inner VIF values of all constructs are sufficiently low, so this is no problem. Next, the path coefficients and R^2 values can be checked to see to what degree the hypotheses are support by the model. Taking all the direct effects into account, H2 and H3 are strongly supported, although H1 received only weak support. However, the indirect effect of ITC on PA, mediated by PKP, shows stronger support for H1. These results provide support for all hypotheses and the effect of ITC on PA is partially mediated by PKP.

Contents

1. Introduction

1.1. Background

Effective and efficient healthcare organizations are increasingly important for every community to stay healthy. New forms of Information Technology (IT) are being developed, integrated and standardized to improve healthcare (Ludwick & Doucette, 2009) and some governments even stimulate healthcare organizations with nation-wide financial incentives to adopt these new technologies (Blumenthal, 2010). Implementing technologies such as an electronic medical record is supposed to improve clinical quality, service efficiency and reduce costs (Chiasson, Reddy, Kaplan, & Davidson, 2007; Haux, 2010).

Several researches have pointed out the importance of developing high quality IT competencies (Fink, 2011; Van de Wetering, Versendaal, & Walraven, 2018). One of these IT competencies is IT ambidexterity, which in this context, means the ability to simultaneously explore newly developed forms of IT as well as exploit them (Gibson & Birkinshaw, 2004; Im & Rai, 2008). Moreover, the dynamism of an organization's environment is known to impede the degree to which IT competencies and IT ambidexterity can help to improve an organization's performance (Chakravarty, Grewal, & Sambamurthy, 2013; Lee, Sambamurthy, Lim, & Wei, 2015). Considering the importance of IT in a hospital setting, changes in the environment related to patient requirements and information technology seems highly important to take into account.

Aside from IT competencies, which are considered an important driver for a hospital's performance (Bradley, Pratt, Thrasher, Byrd, & Thomas, 2012), knowledge assets and knowledge capabilities have also been found to have an impact on both a hospital's financial as well as patient performance (Wu & Hu, 2012). Although a relationship between knowledge sharing and a customer's relationship has been researched before without finding support (Im & Rai, 2008), it may still prove to be an important relation in the context of a hospital's patient relationship and in extension, a patient's service performance.

This research seeks to contribute to the field of IT management in the hospital sector by focusing on the interactions between IT competencies, knowledge processes and their effect on performance. By empirically verifying the nature of these relations and elaborating on the role that IT competencies and knowledge processes play in patient agility, this research delivers managerial and theoretical understanding, as well as possibilities for future research.

1.2. Exploration of the topic

As shown in the previous section, several concepts are important in this research. IT competencies have been the topic of many studies (Bradley et al., 2012; Chakravarty et al., 2013; Van de Wetering et al., 2018) which has often comprised either IT infrastructure and/or IT capabilities. In this research, we will focus on IT capabilities (ITC), because we are mainly interested to see how an organization actively deploys and handles its IT infrastructure, not how well this infrastructure is setup. The definition of Chakravarty et al. (2013) will be used to define ITC because it reflects how well an organization manages its IT. ITC is the organization's technical and managerial skills concerning IT, which includes the proficiency to leverage IT systems as well as all the skills necessary to successfully implement an IT system. This also includes the human skills that enable an organization to identify future needs that are related to changes in the organization's environment.

Knowledge processes have been related to the performance of customer's relationships (Im & Rai, 2008), to customer response capabilities (Jayachandran, Hewett, & Kaufman, 2004) as well as hospital

process capabilities and, in extension, patient performance (Wu & Hu, 2012). In this research, we will retain the definition of knowledge processes (hereafter referred to as 'patient knowledge processes' or 'PKP') as defined by Jayachandran et al. (2004) because this definition emphasizes the need to take in external information, disseminate it and use it on a strategic level to improve the organization. A patient knowledge process is an organization's ability to generate, analyze and disseminate patient-related information for the purpose of strategy development and implementation.
The role of PKP in relation to ITC and Patient Agility (PA) however, is not quite clear. In some papers, knowledge processes, or the similar concept of absorptive capacity, is treated purely as an antecedent for customer response capability or other forms of firm performance (Jayachandran et al., 2004; Wu & Hu, 2012). In another paper, IT use is treated as an antecedent for absorptive capacity (Iyengar, Sweeney, & Montealegre, 2015). In the study of Tanriverdi (2005), knowledge management capabilities are viewed as a mediating factor between a concept called IT Relatedness and Corporate Performance. Though not yet certain, these studies show that ITC or similar concepts, are usually viewed as an antecedent for knowledge processes and the latter, in turn, is normally treated as an antecedent for concepts related to firm performance. This indicates that PKP may be a mediating factor between ITC and PA.
Finally, PA, as well as the similar concept of patient response capability, has been a topic of past research as well (Bradley et al., 2012; Roberts & Grover, 2012b; Wu & Hu, 2012), sometimes defined through the perspective of the Balanced Scorecard (Norton & Kaplan, 1996). However, as the ability of a hospital to sense and respond to new patient-based opportunities seems of utmost importance, the definition of Roberts and Grover (2012b) will be retained. Sensing is about continuously attempting to developing ways to proactivly discover a patient's needs, possibly even before the patient is aware of these needs. Responding is about the speed with which a hospital responds to perceived needs of a patient, or to perceived changes in these needs.

1.3. Problem statement

Much research has already been performed in the area of ITC, PKP and/or PA. IT infrastructure integration has been confirmed to support digital capabilities (Van de Wetering et al., 2018) as well as support patient-centric response (Bradley et al., 2012). In other studies, knowledge processes and capabilities have been confirmed to support customer response capabilities (Jayachandran et al., 2004) and indirectly, patient performance (Wu & Hu, 2012).
The reliance of healthcare organizations on the tacit knowledge of their employees to provide healthcare (Bose, 2003; Wu & Hu, 2012), and the increasing incorporation of IT in healthcare processes (Haux, 2010; Hendrikx, Pippel, Van de Wetering, & Batenburg, 2013) underscores the importance of the above mentioned capabilities. However, as long as it is unknown *how* ITC, PKP and PA are related in a hospital setting, they will not be able to build effective healthcare information systems. This research seeks to elucidate this problem by providing new findings to add to the body of knowledge and giving new managerial insights.

1.4. Research objective and questions

The objective of this research is to find out what the relationship is between ITC, PKP and PA. The following research questions will logically lead to achieving this objective:

1. What is the relationship between PKP and PA?
2. What is the relationship between ITC and PA?
3. What is the relationship between ITC and PA, with PKP as a mediating factor?

Researching the extant literature will deliver the relevant theoretical frameworks that may help to predict whether these capabilities are related or not. The resulting framework will lead to a set of hypotheses that will need to be tested. Testing these hypotheses, will require data and a means to analyse it. After analysis, the findings should tell us whether ITC, PKP and PA are related as mentioned above.

1.5. Motivation/relevance

Constantly changing IT landscapes are a challenge that every organization faces. There is reason to believe that the IT skills employed by a hospital can make a difference in the degree to which these IT systems can contribute to improved sense-and-respond capabilities, or agility, but this is uncertain. Moreover, the nature of this relation has not been researched yet. Also, the degree to which these IT skills impact a hospital's ability to process knowledge concerning their patients is not known. The aim of this research is not only to add to the body of knowledge, but also to give managerial insight into how these capabilities affect each other.

1.6. Main lines of approach

In section 2, a theoretical framework will be selected that can be used as a foundation for the remainder of this research. After that, research articles will be selected that can provide preliminary answers to the research questions and thus, help to formulate hypotheses. In section 3, the latent variables and items will be defined with which the hypotheses can be tested and an analysis method will be selected with which the data will be evaluated. Also, measures to test validity, reliability and other ethical aspects will be discussed. Section 4 will show how the data was gathered and what the results are of the analyses determined by section 3. Finally, in section 5, the results of this research will be put back into the context of the scientific discussions.

2. Theoretical framework

2.1. Theories

As the preliminary search for literature in the previous chapter has shown, there are many research articles to be found that concern the topics mentioned in the research questions. There are, therefore, probably theories to be found that can help to predict whether there is any relationship between ITC, PKP and PA.

The two most commonly cited theories found in the previously mentioned articles are the resource-based view (RBV) (Barney, 1991; Bradley et al., 2012; Fink, 2011; Jayachandran et al., 2004; Van de Wetering et al., 2018; Wade & Hulland, 2004; Wu & Hu, 2012) and to a lesser degree, the dynamic capabilities theory (DC) (Chakravarty et al., 2013; Lee et al., 2015; Teece, Pisano, & Shuen, 1997). The resource-based view (Barney, 1991) emphasizes the development of specific resources to create competitive advantage. An organization should select the internal resources and capabilities that are best fit to exploit external opportunities. Resources are defined as transferable, non-firm-specific assets and capabilities are a special type of resource that are defined as non-transferable and firm-specific. Although this theory may help explain how the capabilities that are the focus of this research interact with each other, it also assumes that the underlying resources are always deployed properly. However, taking the dynamic environment of a hospital setting into account, it shouldn't be assumed

that this will always be the case. After all, if the available technology and patient requirements change, then ITC and PKP will most likely be misaligned in respect to the external environment.
The dynamic capabilities theory (Teece et al., 1997) is an extension of the RBV that posits that an organization should build and reconfigure its competences in order to address changes in the environment. According to this theory, there are three roles for organizational processes that help an organization to respond to changes, namely coordination and integration, learning and reconfiguration. Especially the latter two types of processes emphasize the importance for an organization to adapt to discontinuous changes. Putting dynamic capabilities into the context of the research questions at hand, PKP and PA can both be viewed as dynamic capabilities, although ITC is more likely to be categorized as an organizational (core) competence. This indicates that a hospital may use these capabilities to differentiate itself from the competition, but it does not yet explain how these capabilities relate to each other. Nonetheless, the focus of DC on an organization's adaptability in relation to its environment makes this theory more fitting to use as a theoretical foundation to help answer the research questions. It will therefore be used in the following literature review.

2.2. Literature review

2.2.1. Search strategy

Only peer reviewed journal articles will be searched for in this literature review because the objective of this phase is to ascertain what research has been conducted in the area of ITC, PKP and PA, with dynamic capabilities as a theoretical framework. The search engines of the Open Universiteit, as well as Google Scholar will be used to search for relevant articles. Combined, these search engines provide access to a large number of journals that cover business and information technology (Saunders, Lewis, & Thornhill, 2016).
Next, two search queries were developed based on the research questions and the selected theoretical framework. The first query looks for the relation between ITC and PA, as well as the relation between PKP and PA. The second query looks for the relation between ITC and PKP. Refer to addendum 1 for the exact queries and the section concerning hypothesis development for a discussion about the concept definitions.
Only articles published between 2009 and 2019 were selected in order to exclude outdated articles. Also, only articles in the English or Dutch language were selected as the author is fluent in both languages. For the first query, only articles published in the "basket of eight" will be searched for as these journals generally provide high quality publications. For the second query, this filtering was removed as the initial query did not procedure enough useful results.

2.2.2. Search results

The first search query (refer to addendum 1) yielded 119 articles from Google Scholar and the Open Universiteit search engine. The second search query produced 464 articles using the same search engines. The resulting articles were initially filtered on the perceived relevance to the research questions, based on the article's title and the abstract. The most prominent reasons for excluding articles are because dynamic capabilities is not used as a theoretical basis, because the definitions of the constructs are not close enough to the definitions used in the current research, or because the hypotheses cannot be matched to this research. After this filtering, 6 articles remained, which were all read in order to formulate hypotheses.

2.3. Hypotheses development

Ravichandran (2018) investigated the relation between IT competence, organizational agility and the moderating effects of innovation capacity. The latter is of no interest to this research, but organizational agility is defined in the research of Ravichandran (2018) as customer responsiveness, operational flexibility and strategic flexibility. IT competence on the other hand, is defined as an organization's ability to create digital platforms that enable the firm to sense and respond. This is comparable to the definition of ITC as stated in the previous sections, which includes an organization's ability to successfully implement an IT system. The author argues that firms that adopt technologies that enable them to build flexible platforms, help them to respond to market changes, using examples such as Cisco's ERP implementation and Harrah's BI implementation. However, the author mainly focuses on explaining the influence of innovation capacity and less so on explaining how IT competence influences organizational agility.

Lu and Ramamurthy (2011) studied the relation between ITC and organizational agility. They used a slightly different definition of agility and identified two types of organizational agility, namely 'market capitalizing agility' and 'operational adjustment agility'. The former is an organization's ability to quickly respond to and capitalize on changes in the environment, improving the products and services to address a customer's needs. The latter is an organization's ability to change its internal processes to adapt to these changes, which is too much of internal orientation, so it is not of use to the current study. However, market capitalizing agility seems to approximate the definition of PA. Furthermore, Lu and Ramamurthy (2011) identified three dimensions of ITC, namely IT infrastructure capability, IT business spanning capability and IT proactive stance. IT infrastructure capability encompasses how well a firm manages its data services, architectures, networks and applications. IT business spanning capability is a firm's ability to exploit IT resources to help reach business objectives and IT proactive stance is the ability to search for new ways to exploit IT. Our definition of ITC is about an organization's ability to succesfully leverage IT systems (Chakravarty et al., 2013), so IT infrastructure capability seems to be the most relevant type of ITC, though the other types are relevant in part as well. In their study, Lu and Ramamurthy (2011) argued that the three dimensions of ITC mentioned earlier, should be built together in order to enhance agility. Otherwise, IT may in fact impede agility. The authors explained that an integrated infrastructure can be used as a platform to enhance market intelligence. However, as resources are not unlimited, business and IT will still need to be aligned on a strategic level in order to stay focused on the right business initiatives and realize value. Furthermore, businesses that have developed a more proactive stance towards IT, tend to respond better to market changes and can therefore derive more synergy from these platforms.

Taking the results of these studies into account (Lu & Ramamurthy, 2011; Ravichandran, 2018) the following hypothesis is made:

H1: ITC is positively associated with PA

Iyengar et al. (2015) researched the relationship between IT use, knowledge transfer effectiveness and absorptive capacity. Absorptive capacity is defined as a dynamic capability to evaluate new knowledge, assimilate it and use it to commercial ends. This is close enough to the definition of customer or patient knowledge processes. IT use on the other hand, is conceptualized by Popper and Lipshitz (1998) as learning mechanisms that enable the collection, storage and dissemination of organizational knowledge. These are structures that organizations can use in practice to enable

organizational learning. It is however, different from ITC, which is more concerned with IT skills and investments in IT human resources and applications. Still, the context in which Iyengar et al. (2015) conducted their research, was that of franchisees. All IT investments and IT skills would likely remain with the franchisor, and the latter was not within the scope of this research, so ITC may still be an enabling factor of IT use and absorptive capacity in return. However, as ITC was not an object of research in this article, it is not enough to formulate a hypothesis.

Tzokas, Kim, Akbar, and Al-Dajani (2015) investigated the effects of technological capability and absorptive capacity on performance. Technological capability is defined as the ability to perform any relevant technical function or volume activity within a firm. It is not only about acquiring new technology, but also mastering it, which presumably requires having the right IT human resources and so, is close enough to the current study's definition of ITC. The definition of absorptive capacity as seen in this study is largely the same as that of the current research, although it is subdivided as exploratory, transformative and exploitative learning. Tzokas et al. (2015) argue that by developing technological capabilities, a firm needs to invest in R&D, which in turn makes the organization more receptive to new external information. The accumulation and storing of knowledge necessary to develop these new technologies also improves a firm's ability to engage in transformation processes through its evaluation, use and implementation. Finally, as a firm engages more in developing and mastering new technologies, they become more efficient in deploying the existing knowledge and thus, generate more exploitative activities. This leads to the following hypothesis:

H2: ITC is positively associated with PKP

Setia, Venkatesh, and Joglekar (2013) researched the relation between information quality and customer service capabilities, moderated by process sophistication. Information quality is the degree to which information is complete, accurate, current and appropriately formatted. Process sophistication is the complexity and information intensity of a process, although this isn't quite an object of the current research. Finally, customer service capability comprises customer orientation capability and customer response capability, which are defined as a firm's ability to monitor and respond to the needs and wants of the customer respectively.
Although information quality is not explicitly mentioned in the research questions, information is, however, an important part of PKP as defined by Jayachandran et al. (2004). Information quality was found to positively and significantly interact with customer service capabilities and this relation was significantly stronger in firms with higher process sophistication. This research alone, however, is not yet enough to form a hypothesis.

Roberts and Grover (2012b) investigated how IT facilitates agility and in turn, competitive activity. Agility is defined as the degree to which an organization can sense and respond quickly to opportunities for innovation and competitive action. The enabling factors are customer-based knowledge creation, which would enable customer-sensing capability, and operational process execution, which would enable customer-responding capability. These two capabilities form an organization's customer agility, which is the degree to which an organization can sense and respond quickly to new opportunities. As such, it is a close approximation of PA. However, as operational process execution is used to explain customer responding capability, the latter concept cannot be used in the context of the research questions at hand. At any rate, in the study of Roberts and Grover (2012b), the authors argue that the development and leveraging of web-based tools can enhance a firm's ability to sense new opportunities. Using such a platform in combination with analytical capabilities can help an organization to make sense of the data and thus plays an important role in

knowledge creation processes. Assuming that similar web-based platforms and analytical tools are available to hospitals as well, the findings of Roberts and Grover (2012b), as well as Setia et al. (2013), can be used to form the following hypothesis:

H3: PKP is positively associated with PA

The three hypotheses combined, lead to a research model as shown in figure 1.

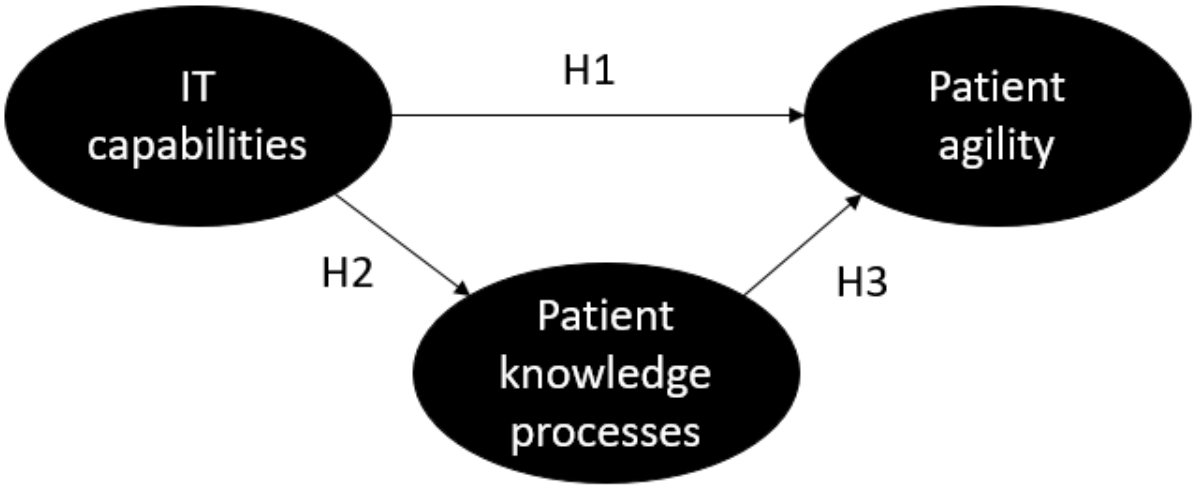

Figure 1 Conceptual design

2.4. Objective of the follow-up research

The objective of the remainder of this research is to test the hypotheses set up in the previous section empirically. The studies mentioned earlier indicate that empirical tests may find support, but the relations between the concepts that the research questions seek have not been tested before. Certainly not in the context of a hospital. Testing the hypotheses will confirm whether these relations exist. In order to achieve this, items should be developed that can measure the concepts, with which healthcare organizations should be queried so that statistical analyses can be performed. This is the subject of the next section.

3. Methodology

3.1. Conceptual design

The objective of the research at hand is to find out whether there is any relationship between ITC, PKP and PA. To achieve this, a positivist approach would be suitable, contrary to an interpretative approach as the objective does not seek to explain the relationships in-depth, but rather seeks to find out whether these concepts are related at all. As there are relevant pre-existing theories and a positivist approach will be assumed, the remainder of this research will be deductive of nature (Saunders et al., 2016).

Taking the three hypotheses into account, three variables will need to be examined: ITC, PKP and PA. It is most likely not possible to measure these variables directly, so these will be treated as constructs

or latent variables. In the previous section, it is hypothesized that ITC will have a direct effect on PA and that this effect will be mediated by PKP. This leads to the structural model shown in figure 1.

3.2. Operationalization

The concepts of ITC and PKP will be treated as first order constructs, whereas PA will be treated as a second order construct that consists of Sensing (PA_S) and Responding (PA_R). This is consistent with the constructs of Customer-Sensing Capability and Customer-Responding Capability as defined by Roberts and Grover (2012b). The constructs will need to be operationalized by defining items with which these constructs can be measured. Items of previous research will be used (Bradley et al., 2012; Chakravarty et al., 2013; Fink, 2011; Jayachandran et al., 2004; Roberts & Grover, 2012b; Wu & Hu, 2012) and measured on a 7 point Likert scale (Likert, 1932) so that the relations sought by the hypotheses can be quantified. Refer to addendum 2 for an overview of the items. The items of the second order construct PA are subdivided by the first order constructs of Sensing (PA_S_#) and Responding (PA_R_#).

To determine whether the constructs should be specified as formative or reflective constructs, the four criteria set out by Jarvis, MacKenzie, and Podsakoff (2003) can be used. First, referring to all first order constructs, taking the definitions of the constructs and the indicators into account, the direction of causality is expected to be from construct to item, as the indicators appear to be manifestations of the constructs. The indicators appear to be interchangeable and dropping one of the indicators is not expected to alter the conceptual domain considerably. Also, all of the indicators are expected to covary and are required to have the same antecedents and consequences. Therefore, all of the constructs will be specified as reflective constructs. In the cases of ITC and PA, this is supported by the studies of Lu and Ramamurthy (2011) and Ravichandran (2018). Aside from the first order constructs, the specification of the relation between the constructs of Sensing (PA_S) and Responding (PA_R) should be considered as well. PA is a construct that encompasses the concepts of sensing and responding to patient needs and taking out either of these two concepts would change the content of this construct considerably. That is why PA_S and PA_R will be specified as formative constructs, making PA, PA_S and PA_R a Type II specification (Jarvis et al., 2003). Please refer to addendum 5 for an overview of the models.

In the research of Tzokas et al. (2015) and hypothesis 2, the knowledge processes (or absorptive capacity) were positioned as a mediating variable and in the study of Roberts and Grover (2012b) and hypothesis 3, knowledge processes were positioned as a formative construct. However, in the current research, the objective is to determine whether PKP has a mediating role between ITC and PA. Therefore, PKP will be positioned as a mediating, reflective construct.

3.3. Data collection

3.3.1. Strategy

The research questions posed in this study seek to find out what the relationships are between the relevant constructs. Moreover, the research at hand is deductive of nature and in order to test whether the proposed relations exist, a larger number of observations is necessary, so a survey would be the most appropriate method (Saunders et al., 2016, p. 181).

The unit of measurement will be at the department level. Leaders of these departments will be contacted to conduct the survey as they are presumably employees who have a good overview of activities conducted concerning PKP and activities to adjust for new patient needs (PA). Also, department leaders are expected to be familiar with changes in IT concerning their own department and can give insight into the degree to which the IT staff can facilitate for new demands (ITC). Furthermore, initially, all Dutch university medical centers and top clinical hospitals will be contacted for this survey because these types of hospitals have the largest numbers of medical professionals. Respondents will also be encouraged to share the survey with colleagues in order to maximize the number of respondents. The time span in which the data will be gathered, is roughly 4 months and the administrator of the survey tool will monitor the progress of received survey responses. After 2 months, the research group will decide whether it is necessary to contact the other types of hospitals as well, in order to meet the minimum number of responses. As this non-random sampling strategy may incur selection bias, a *t*-test will be carried out in which the responses of each type of hospital will be checked for significant differences.

3.3.2. Sample size

The '10 times rule' is often cited to define a minimum sample size (Barclay, Higgins, & Thompson, 1995), which is (1) 10 times the largest number of formative indicators used to measure a single construct, or (2) 10 times the largest number of structural paths directed at a particular construct in the structural model, whichever is larger. However, the minimum sample size should be calculated through the use of a power analysis, which alternatively can be carried out using a program such as G*Power (Hair Jr, Hult, Ringle, & Sarstedt, 2016, p. 25). In order to detect a minimum R2 value of 25% with a significance level of 5% and a statistical power of 80%, a minimum sample size of 48 would be required, according to G*Power.

3.4. Measurement instrument

A single measurement instrument will be used, as splitting up the constructs between for instance, IT and non-IT constructs, would necessitate making matched pairs. The expected response rate is low, so making matched pairs is not considered feasible. Furthermore, because the target population consists of Dutch hospitals, all of the questions need to be translated. The translated questions will be reviewed in two rounds by heads of department and specialists employed by Dutch hospitals to make sure that the questions are understandable and that the terminology is consistent with that of the field of medicine. Please refer to section 4 for the results of these tests. After the tests, an online survey will be created using LimeSurvey, through which respondents can enter their answers. This online tool is chosen because it provides a simple means to spread the survey among the potential respondents and allows for them to resume filling out the survey later if necessary.

3.5. Data analysis

Prior to the data analysis itself, it should be ascertained whether the previously made assertions concerning the first and second order constructs in paragraph 3.1 are justified. In order to do that, a factor analysis will be carried out using IBM's SPSS Statistics version 26. The results shown in addendum 4, should confirm that ITC and PKP each have one underlying factor, whereas PA has two underlying factors.

Given that this research requires several variables to be analyzed simultaneously, a multivariate analysis is required. Among the second-generation techniques of multivariate analyses (Hair Jr et al., 2016) are covariance-based structural equation modeling (CB-SEM) and partial least squares structural equation modeling (PLS-SEM). CB-SEM is mainly used to test hypotheses of existing theories and PLS-SEM is mainly used when there is less prior knowledge about how the variables relate. These structural equation modeling methods, in comparison to the first-generation methods such as multiple regression and factor analysis, have the advantage of being able to find unobservable variables through indicator variables. Measurement errors can also be taken into account in observed variables, so the difference between observed values and the 'true' value of a variable can be made explicit. Also, when comparing CB-SEM and PLS-SEM, the latter does not require normal distribution in the data set and does not assume that the covariations between sets of indicators have to be explained through a common factor (Hair Jr et al., 2016), which cannot be assumed in the current research. That is why PLS-SEM will be used to analyze the survey data. Furthermore, the analyses can be carried out using several brands of software, among which is Smart PLS, which will be used in this research.

3.6. Validity, reliability and ethical aspects

Before moving on to the data analysis, the population will be described by calculating several descriptive statistics. Among these are the response rate, the number of healthcare professionals and hospitals contacted, the average experience of the healthcare professionals, their department and type of hospital, the average number of patients received by the respondents and the average number of employees working in the respondent's department and hospital.

In order to assess to what degree the hypotheses fit the data, a number of evaluation metrics will need to be calculated and evaluated (Hair Jr et al., 2016, p. 106). Validity is the degree to which the measurements measure what was intended and can be evaluated in several forms. Content validity is the degree to which the measures cover the construct and this will be covered by using items and construct definitions that have been used in pre-existing literature. This ensures that these definitions have been tested before. Convergent validity is the degree to which measures of the same construct are related, which should apply to reflective constructs. The indicator reliability and Average Variance Extracted should be evaluated to prove that the measures are indeed related. Also, discriminant validity is the opposite, which shows the degree with which the measures are indeed unrelated to constructs with which they are not supposed to be related with. Currently, the most reliable method of assessing discriminant validity is the Heterotrait-Monotrait ratio (Hair Jr et al., 2016, p. 118). Finally, internal consistency should be evaluated to check to what degree the measures are consistent. To this end, Cronbach's Alpha and Composite Reliability should both be calculated. The former tends to be more conservative than the latter(Hair Jr et al., 2016, p. 112) and therefore, both should be taken into account to evaluate internal consistency.

As for ethical aspects, the General Data Protection Regulation (GDPR), applicable to all organizations that handle data that belong to EU citizens, should be taken into account. This legislation is meant to protect the privacy of these citizens and may lead to considerable fines if their rights and freedoms are not protected. There are a few measures that should be implemented to meet the demands of the GDPR. Communication with the survey tool should be encrypted and all responses should be anonymized, for as far as possible. A LimeSurvey server is normally delivered through an encrypted HTTPS connection and the survey itself can and will be configured not to log anything that can be used to trace a respondent. Respondents will, however, be given the option to add their email address to

the response if he or she wishes to receive a summary of the survey itself. These email addresses will be removed from the dataset after the summaries have been sent.

4. Results

4.1. Survey results

As mentioned in the previous section, the measurement instrument was reviewed in two rounds by medical professionals. This resulted in shorter concept definitions, changes in the terminology used in the concepts to make the texts more accessible and more consistency in the formulations. Aside from the translations, the items themselves remained unchanged. The resulting questions are shown in addendum 2. After the review, the hospitals were allocated equally to all the research team members and every team member started to contact potential respondents. Some of the researchers who had connections with people employed by hospitals attempted to have them fill out the survey or pass it on to other people who could fill it out. Some of the hospitals were selected to contact every department by phone in an attempt to have the head of the department fill out the survey. Finally, potential respondents were contacted through LinkedIn and were asked to fill out the survey. Every potential respondent was sent a mail containing a link to LimeSurvey and an initial explanation of the goal of the research. Furthermore, it was stated that the survey is anonymized to ensure privacy by default, that respondents can receive a summary of the survey if they wish, and that a donation would be made to the CliniClowns foundation for every completed survey response. This lead to 593 mails sent with a request to fill out the survey form and 124 personal contacts with respondents to fill out the survey. The total number of completely filled out surveys is 108, so the response rate is 15.1%. Please refer to addendum 3 for the complete data set.

4.2. Data quality

4.2.1. Data examination

The total number of completed survey responses meets the minimum number referred to in the previous section. The mean-variance and standard deviation was calculated for every respondent to check for suspicious response patterns. None were found. Also, none of the responses included missing values. As all indicators are based on a 7-point Likert scale and the responses were gathered through an online survey that only allows specific responses, no outliers were found, also after visual inspection.

The skewness of all indicators varies between -0.799 and 0.092, showing there are no problems with skewness. However, excess kurtosis varies between -1.216 and -0.096. 7 of the indicators are lower than -1.0, meaning that these indicators may have too many outliers. However, as these levels of kurtosis are not severe, the items will be retained.

4.2.2. Descriptive statistics

The majority of the respondents have managerial positions, such as head of department (44.4%), business manager (10.2%) and chef de clinique (2.8%). Nearly a quarter of the respondents are a doctor (23.1%) and the remaining respondents hold other positions (19.4%). This is a good combination of respondents that hold both managerial and operational positions. 44.4% of the

respondents have more than 5 years of experience as a doctor, whereas 51.9% have reported not to be employed as a doctor and have therefore no experience as such. These are mainly the heads of department, team leaders and other types of managers. Employees who manage departments do not necessarily need experience as a doctors to do their work, so this is as expected.

Aside from the large share of respondents that indicated their own definition of a department (26.9%), the most common departments are obstetrics (8.3%), surgery (6.5%), pediatrics (5.6%), intensive care for adults (4.6%) and cardiology (4.6%). All of the a priori defined departments in the survey are considered appropriate to be included in this research. All of the respondents who reported their own definition of a department should however, be inspected. It is uncertain whether some of the given departments, such as imaging and radiology, have enough interaction with patients to properly reply to questions concerning patient knowledge. These responses will nevertheless be retained, although one response from an advisor, working for a department of Finance and Control, will be removed from the dataset as it is unlikely that this respondent has enough patient interaction to make informed replies to the questions concerning constructs such as PKP and PA. The analyses in the following sections will therefore be conducted using a dataset of 107 observations.

The average number of doctors working in the respondent's department is 29.8 and the average total number of employees on the same department is 149.9. Some of the respondents reported to have 0 doctors working in their department, but some departments have doctors working for those departments on an as-needed basis, such as outpatient surgery. Furthermore, the number of patients that visit the respondent's departments vary greatly, with 23.1% that see less than 4,000 patients per year, 51.9% see between 4,000 and 14,000 patients per year and 25% see more than 14,000 patients on an annual basis.

4.2.3. Selection bias

In the Netherlands[1], there are 8 university medical centers (5.2%), 28 top clinical hospitals (18.2%) and 118 general hospitals (76.6%). Among the survey's respondents, 36 work for university medical centers (33.6%), 41 work for top clinical hospitals (38.3%) and 27 work for general hospitals (25.2%), which indicates selection bias. A *t*-test that compares the responses of each type of hospital with all other hospitals shows insignificant values for all items ($p > 0.106$), except for item PA_S_2 ($p = 0.001$). It appears that respondents in the category of Other General Hospitals (OAZ) give significantly different answers to this question, which refers to the use of historical data to predict future needs. This level of bias can be considered acceptable for this type of exploratory research. Please refer to addendum 2 for the survey items.

4.2.4. Non-response bias

Non-response bias should be taken into account, which can be achieved by checking whether there is a significant difference between early and late responders. All of the received responses were divided with a 75:25 split and a *t*-test was carried out for the number of doctors and total FTE's, as well as all indicators. All of the indicators showed no signs of non-response bias ($p > 0.194$), although there is a significant difference in the number of doctors employed in the respondent's department ($p = 0.002$) and the department's total number of employees ($p = 0.000$), which does indicate non-response bias.

[1] https://www.volksgezondheidenzorg.info/onderwerp/ziekenhuiszorg/cijfers-context/aanbod#node-aantal-instellingen-voor-medisch-specialistische-zorg

The average number of doctors and FTE's in the first 75% of the respondents is much greater than that of the last 25%. This is most likely due to the fact that the researchers started gathering data from the largest hospitals, so the departments of the early responders are most likely large as well. As long as the indicators show no significant differences, this is not a problem.

4.3. Analysis of the measurement model

4.3.1. Factor analysis

Using the extant literature, it is assumed that ITC is a single, first order construct (Chakravarty et al., 2013; Fink, 2011), PKP is assumed to be a single, first order construct (Jayachandran et al., 2004; Wu & Hu, 2012) and PA is assumed to be a second order construct that consists of the first order constructs of Sensing (PA_S) and Responding (PA_R) (Bradley et al., 2012; Jayachandran et al., 2004; Roberts & Grover, 2012a). However, because not all of these concepts were explicitly defined as first and/or second order constructs, an Exploratory Factor Analysis (EFA) can be carried out to verify these assumption. An EFA can be used to determine the number of common factors that influence a set of measures (DeCoster, 1998), which makes it an appropriate approach for this issue. SPSS version 26 was used to perform the factor analysis and the results can be found in addendum 4. All KMO measures are at 0.791 or greater and Bartlett's test of sphericity for every construct is at a significance level of 0.00%, indicating that a factor analysis may be useful for this data. All communalities exceed the 0.4 threshold except for ITC_5, which is at 0.369. This can still be considered to be sufficient consistency between the variables. In the cases of ITC and PKP, only one factor is found that explains 50% and 53% of the total variance, whereas in the case of PA, two factors are found that explain 70% of the total variance. This confirms the previously made assertions that PA is a second order construct, consisting of Sensing (PA_S) and Responding (PA_R). Consequently, the follow-up analyses in PLS-SEM for the measurement model and the structural model will need to be carried out using two different models as PLS-SEM does not accommodate for a comprehensive evaluation of a hierarchical component model. Please refer to addendum 5 for an overview of the models.

4.3.2. Internal consistency

The PLS-SEM algorithm was run with the path weighting scheme, initial values of the outer weights at +1 (as all indicators are coded so that high values are more favorable), and the stop criterion was set to 10^{-7} with a maximum number of 300 iterations. The algorithm converged after 11 iterations.
The calculated values for Cronbach's Alpha range from 0.857 to 0.934, and the values for Composite Reliability range from 0.897 to 0.950. Please refer to table 1 for an overview. These values indicate that there may be redundant items in the reflective constructs. The highest value concerns the composite reliability of PA_R, with a value of 0.950. However, the same items and constructs were used in the research of Roberts and Grover (2012b), in which the researchers reported Alpha values as of respectively 0.87 and 0.92, so this combination of items is most likely known to be slightly redundant. Nevertheless, internal consistency should be estimated as a value between Cronbach's Alpha and Composite Reliability (Hair Jr et al., 2016), so as the average of these values is still below the critical threshold of 0.95, the items will be retained.

Table 1 Survey items and (cross) loadings

		(cross) loadings				
Code	**Construct / items**	**ITC**	**PKP**	**PA**	**PA_S**	**PA_R**
ITC	**IT Capability**: alpha = 0.857, composite reliability = 0.897, AVE = 0.637					
ITC_1	We have strong technical IT skills	0.757	0.379	0.340	0.253	0.332
ITC_2	We have adequate knowledge about IT	0.835	0.488	0.416	0.368	0.357
ITC_3	Our IT skills are comparable with the best in the industry	0.848	0.499	0.447	0.438	0.346
ITC_4	We invest heavily in our IT human resources	0.770	0.454	0.476	0.461	0.372
ITC_5	We have a good understanding of the possible benefits of IT applications.	0.776	0.493	0.391	0.357	0.325
PKP	**Patient Knowledge Processes**: alpha = 0.875, composite reliability = 0.906, AVE = 0.616					
PKP_1	We regularly meet patients to learn about their current and potential needs for new health services	0.351	0.722	0.343	0.425	0.187
PKP_2	Our knowledge of patients' needs is thorough	0.458	0.781	0.530	0.576	0.360
PKP_3	We systematically process and analyze patient data and information	0.477	0.741	0.493	0.545	0.326
PKP_4	We regularly study our patient's needs for new health service development	0.474	0.813	0.368	0.513	0.151
PKP_5	We have interdepartmental meetings regularly to discuss patient's needs	0.521	0.850	0.522	0.609	0.317
PKP_6	Our department spend time discussing patient's future needs with other (clinical) departments	0.443	0.797	0.607	0.634	0.434
PA	**Patient Agility**: alpha = 0.915, composite reliability = 0.930, AVE = 0.571					
PA_S	**Patient Agility, Sensing**: alpha = 0.904, composite reliability = 0.929, AVE = 0.723					
PA_S_1	We continuously try to discover additional needs of our patients of which they are unaware.	0.426	0.659	0.759	0.877	0.469
PA_S_2	We extrapolate key trends to gain insight into what patients in a current market will need in the future.	0.391	0.587	0.632	0.738	0.345
PA_S_3	We continuously try to anticipate our patients' needs even before they are aware of them.	0.382	0.613	0.804	0.897	0.526
PA_S_4	We attempt to develop new ways of looking at patients and their needs	0.454	0.582	0.658	0.811	0.363
PA_S_5	We sense our patient's needs even before they are aware of them.	0.389	0.583	0.737	0.879	0.433
PA_R	**Patient Agility, Responding**: alpha = 0.934, composite reliability = 0.950, AVE = 0.792					
PA_R_1	We respond rapidly if something important happens with regard to our patients.	0.353	0.478	0.770	0.466	0.846
PA_R_2	We quickly implement our planned activities with regard to patients	0.481	0.378	0.789	0.509	0.840
PA_R_3	We quickly react to fundamental changes with regard to our patients	0.389	0.356	0.806	0.456	0.913
PA_R_4	When we identify a new patient need, we are quick to respond to it.	0.370	0.243	0.773	0.392	0.916
PA_R_5	We are fast to respond to changes in our patient's health service needs	0.337	0.283	0.804	0.434	0.930

4.3.3. Convergent validity

The outer loadings of all items of reflective constructs are greater than the minimum of 0.7. Furthermore, the Average Variance Extracted (AVE) of all reflective constructs range from 0.571 to 0.792, which is above the threshold of 50%. This means that each construct explains at least 57% of the variance of its indicators, so convergent validity is established.

4.3.4. Discriminant validity

The square root of the AVE of every reflective construct was higher than the construct's highest correlation with other constructs, so the Fornell-Larcker criterion poses no problem. None of the indicators loaded higher on to another construct than the one to which they were assigned, so the cross-loadings are good. Of course, the items of first order constructs PA_S and PA_R also loaded high on second order construct PA, but this is to be expected.

Table 2 Heterotrait-Monotrait Ratio (HTMT)

Path	Original Sample (O)	Sample Mean (M)	2.5%	97.5%
PA -> ITC	0.590	0.590	0.416	0.743
PA_R -> ITC	0.485	0.483	0.289	0.659
PA_R -> PA	0.945	0.945	0.910	0.976
PA_S -> ITC	0.538	0.539	0.362	0.704
PA_S -> PA	0.946	0.946	0.905	0.983
PA_S -> PA_R	0.547	0.545	0.361	0.705
PKP -> ITC	0.664	0.664	0.500	0.799
PKP -> PA	0.691	0.694	0.572	0.809
PKP -> PA_R	0.418	0.422	0.272	0.588
PKP -> PA_S	0.790	0.789	0.667	0.888

A more reliable criterion to detect discriminant validity issues, however, is the Heterotrait-Monotrait ratio (HTMT). Using the results from the PLS-SEM algorithm's report, all first order reflective constructs' values ranged from 0.418 to 0.790, which is below the threshold level of 0.85. Additionally, the HTMT ratio should be checked to be significantly different from the value of 1, for which a bootstrap procedure of 5000 samples was executed. The results can be seen in table 2. All values between first order reflective constructs are below the threshold level of 0.85, so discriminant validity is established.

4.4. Analysis of the structural model

4.4.1. Collinearity

The construct of PA has a number of exogenous constructs that predict it, as well as its own first order formative constructs of Sensing (PA_S) and Responding (PA_R). Therefore, the structural model should first be checked for collinearity, to make sure that one construct does not inflate the variance of another. The inner VIF values of all constructs are at 2.401 or lower, so collinearity is no problem in the structural model.

4.4.2. Significance and relevance of relationships

In order to determine the path coefficients and *t* statistics in the mediated model at hand, a bootstrap procedure was executed with 5000 samples. Table 3 shows the direct, indirect and total effects resulting from this procedure. The direct effect of ITC on PKP is very strong and significant with a path coefficient of 0.580 and a *t*-value of 8.548 (p = 0.00). This provides strong support for H2. The effect of PKP on PA is also very strong with a path coefficient of 0.479 and a *t* value of 5.078 (p = 0.00), providing strong support for H3. The direct effect of ITC on PA is rather weak with a path coefficient

of 0.242 and a *t* value of 2.395 ($p = 0.017$), providing weak support for H1. However, the indirect effect of ITC through PKP on PA is moderately strong with a path coefficient of 0.278 and a significant with *t* value of 4.191 ($p = 0.00$). The total effect of ITC on PA is therefore strong, with a path coefficient of 0.520 and significant with a *t* value of 6.642 ($p = 0.00$), which lends support for H1, albeit indirectly through PKP. This indirect relationship was not initially hypothesized and is nonetheless mentioned in table 3 that it indirectly supports H1. The fact that the direct relationship between ITC and PA is weak and less significant, whereas the indirect relationship through PKP is considerably stronger, means that the effect of ITC on PA is partially mediated by PKP.

Table 3 Path coefficients & significance

Path	Original path coefficient	Bootstrapped path coefficient	Standard deviation	T statistic	P value	Hypothesis support
Direct effects						
ITC -> PA	0.244	0.242	0.102	2.395	0.017	H1 weakly supported
ITC -> PKP	0.583	0.580	0.068	8.548	0.000	H2 strongly supported
PKP -> PA	0.479	0.479	0.094	5.078	0.000	H3 strongly supported
Indirect effects						
ITC -> PA	0.279	0.278	0.067	4.191	0.000	Not initially hypothesized, but indirectly supports H1
Total effects						
ITC -> PA	0.523	0.520	0.079	6.642	0.000	Not initially hypothesized, but indirectly supports H1

The R^2 values of both PKP and PA (0.342 and 0.433 respectively) can be considered weak to moderate. A fair amount of the variance in PKP and PA is explained by their independent variables, though a large portion of the variance is not explained through this model. This is a possible area for further future research. Furthermore, the f^2 effect size of ITC on PA (0.083) can be considered small, which means that if ITC is removed from the model, a large portion of the variance is still explained by PKP directly. However, the effect size of ITC on PKP (0.541) and PKP on PA (0.287) can be considered large and medium respectively. This further supports the assertion made earlier, that PKP partially mediates the effect of ITC on PA.

Finally, the value for Q^2 should be calculated to check whether the model has predictive relevance, i.e. whether omitting data from the dataset can be estimated using the remaining data. To this end, a blindfolding procedure was carried out with an omission distance of 7. The total Q^2 value for the endogenous constructs of PKP and PA were 0.317 and 0.395 respectively. Although the Q^2 value dropped below 0 in one case, the total Q^2 value for both constructs are sufficient to establish predictive relevance.
Taking ITC out of the model and carrying out the blindfolding procedure again leads to a Q^2 value of 0.366 for PA, meaning that ITC has a rather small q^2 effect size of 0.048 on PA. Carrying out the same test for PKP shows that it has a medium q^2 effect of 0.24 on PA.

5. Discussion

5.1. Implications for research

The results of this research are to some degree in contrast with the extant literature. First concerning the hypothesis that ITC is positively related to PA. In the study of Ravichandran (2018), IT competence was found to strongly influence organizational agility, both of which concepts have elements that are in line with the current research. In this study however, ITC is found to have a much weaker direct

relationship with PA. This may be because building IT platforms and the functionality and quality of these platforms, have a more prominent role in the concept of IT competence, whereas IT Capabilities is a narrower domain that is about an organization's IT skills and IT knowledge. Having these skills may enable an organization to build better IT platforms, but it is not as much directly related to being able to better service a patient's needs. Interestingly, Lu and Ramamurthy (2011) studied the effects of IT Capabilities on Organizational Agility and defined three dimensions of ITC, which are IT infrastructure capability, IT business spanning capability and IT proactive stance. They posited that these three capabilities should be deployed in a coordinated effort in order to enhance agility. A disjointed implementation may actually impede agility. However in this research, IT capability, which is most similar to the aforementioned IT infrastructure capability, is shown to have a strong, albeit indirect effect on Patient Agility, mediated by Patient Knowledge Processes. Perhaps these three dimensions of IT competence need not be implemented in a concerted manner for it to have a positive effect on an organization's agility. The latter cannot be stated with certainty however, so this may be ground for further research.

Secondly, concerning the hypothesis that ITC is positively related to PKP, this research adds to the field of technological capabilities and absorptive capacity as researched by Iyengar et al. (2015) and Tzokas et al. (2015). In the former research, IT use, knowledge transfer effectiveness and absorptive capacity were found to be positively related. Although the context was somewhat different, similar relations have been found between ITC and PKP. Adding to the work of Iyengar et al. (2015), this research shows that it is not only the learning mechanism of provided IT that impacts absorptive capacity or knowledge processes, but also the competence of an organization's IT staff. These processes in turn, appear to affect a broader definition of an organization's performance, which is not only financial, but also the degree to which an organization can sense and respond. In the research of Tzokas et al. (2015), technological capability was shown to be an important driver for absorptive capacity and by extension, an organization's performance. More importantly, it was argued that mastery of technology with the right IT human resources is necessary to exploit new technology, which is underscored by this research. IT Capabilities are indeed an important factor to enable knowledge-intensive processes.

Finally, concerning the hypothesis that PKP is positively related to PA. Setia et al. (2013) found that information quality is an important driver for customer service capabilities, which partially served as a basis for this hypothesis. The results of this research add to this discussion and show that the organizational mechanisms in which this information is used, is also an important factor to better serve a customer, or to be more precise in this context, a patient. It is not just the quality of information that help to serve patients, but having regular interdepartmental meetings to share this information is certainly important as well. The view on customer or patient agility taken here, with respect to the enabling factors, is different from that of Roberts and Grover (2012b). In the latter study, customer-based knowledge creation was related to sensing and operational process execution was related to responding. The focus in this study, however, was both on generating this knowledge, but also sharing it with other departments, which is nonetheless in line with the findings of Roberts and Grover (2012b). In their research, it was argued that developing web-based tools would help to enhance an organization's sensing capabilities. This research adds that not only having the right tools, but also developing IT skills and IT knowledge also helps to build IT-enabled processes that support to sense and respond to a patient's needs.

5.2. Implications for practice

This study has a few implications for practice. First of all, senior management is advised to invest in developing an IT workforce that can compare itself with the best of the industry. Investing in IT human resources and making sure that their knowledge of IT is up to par are important factors that help to develop stronger IT capabilities. Organizations should check their Human Resources processes and

make sure that the qualities expected of new personnel are high enough so that they can compete with the best of the industry. They are also advised to develop education and training programs through which the IT human resources can mature. Having IT personnel with more advanced skills will allow the organization to take advantage of the latest developments in Information Technology and deploy application suites such as Office 365 and integrate new technology with existing processes.

Improvements to IT Capabilities in turn can aid an organization to facilitate the processes that an organization needs to have interdepartmental meetings and other forms of interdisciplinary interaction to discuss a patient's needs. The results show that systematically processing and analyzing patient data and sharing this information in interdepartmental meetings help to make sure that a hospital can see a patient's needs coming and respond in an adequate manner, all of which can be made easier through IT-enabled processes, developed by a competent IT workforce. In multidisciplinary meetings, for instance, where a specific patient with an undiagnosed affliction is being discussed, medical professionals who attend the patient can discuss symptoms they have registered. By pooling the available knowledge and expertise, the patient may be diagnosed faster and more accurately. Moreover, a patient may be served even better if these processes are supported by applications such as Microsoft Teams, through which professionals may also share documents and meet remotely. Setting up a properly functioning application environment that supports these processes does require improved IT Capabilities, which is all the more reason for higher management to develop these capabilities.

5.3. Limitations

This research has a few limitations, one of which is the fact that information about all of the concepts covered, were gathered from the same respondents. A fair amount of the respondents are doctors and are mainly occupied with the daily operations of a hospital. They may not be aware of all the efforts of a hospital's upper management to improve their IT capabilities, so those responses may be biased. Performing a matched-pair survey could solve this issue, although that would require a much larger number of hospitals to contact, which in turn, could be solved by extending the geographical area under consideration.

As mentioned in section 4, there is a selection bias concerning the types of hospital that were contacted. This is mainly due to the research team's approach to gathering the information. University Medical Centres and Top Clinical Hospitals were initially contacted exclusively, as these organizations were considered to be more familiar with research and may be more inclined to cooperate. As the research progressed, the response rate was considered too low and only after a fair few weeks did the team decide to contact all other Dutch hospitals as well. The fact that the team had less contacts in this added group of hospitals, might also account for the selection bias.

Finally, the control variables were set up in a manner that limits the possible analyses. For instance, the number of years of experience that a respondent has, was set up using an interval scale, but not equidistant, as the final option is '25+ years'. This disables one from carrying out a student's *t*-test to check for non-response bias. Furthermore, this data cannot be used to find correlations between these control variables and the latent variables of ITC, PKP and PA, although that was not an objective of this research.

5.4. Conclusion

In this research, it was theorized that IT Capabilities directly support Patient Agility and Patient Knowledge Processes, and that the latter, in turn, supports Patient Agility. While a direct relation has been found to be rather weak, the results show that IT Capabilities is an enabling factor for sensing

and responding to patient needs. Having well developed IT skills, knowledge about IT and investing in IT human resources are important drivers that can help to enable knowledge processes. In this study, it was found that the most important factors that encompass these processes are activities through which a patient's needs are thoroughly assessed and regular meetings in which these needs are discussed. More importantly, these meetings should span multiple departments so interdisciplinary interaction between medical professionals and management should be encouraged. As IT Capabilities is found to be an important driver for these processes, IT does indeed help to facilitate these processes, although it should be noted that the variance explained by IT Capabilities is still moderate. There are most likely other important factors that enable these knowledge processes that are not taken into account in this research. The same goes for Patient Agility. The amount of variance explained by Patient Knowledge Processes is moderate, but there is nonetheless a strong and significant relation, one that is stronger among organizations that have invested more in their IT knowledge, skills and human resources.

5.5. Reflection

Some parts of the research process went better than others. First of all, the hypotheses are quite well founded on extant literature, with two studies for every hypothesis that serve as a basis. This produced a solid basis for the expectations of what would be observed empirically. However, as the hypotheses were set up, they only explicitly dealt with direct relationships, whereas the research questions and the indirect effects dealt with mediated effects as well. It would have been better to incorporate the mediating effects in the hypotheses as well, but as this has been taken into account in the research questions and the results section, this is of no great consequence.

The most difficult part of the research process was the literature study. The research questions deliver a very clear set of search terms, but combining these search terms with other criteria such as specific publishing journals and year of publication, considerably limited the search results. Checking whether the resulting articles take a certain theory as a foundation further reduces the results, oftentimes to nil. However, even the slightest adjustment in search terms or other criteria often increased the results much too high, so that reading through the abstracts or even the titles was not feasible. This was mainly the case in the search for articles that deal with the effect of ITC on PKP and that is why there is a difference in the search queries used, as can be seen in addendum 1. The main difference lies in the filtering on the 'basket of eight' publishing journals, which was not used in the second query to generate more results. Only one article was used in formulating the hypotheses that was not of the 'basket of eight' and it could have been checked more thoroughly for quality.

Setting up the measurement instrument took a few weeks, but in the author's opinion, the end result was quite good. All of the items were taken from the relevant literature but as the research team could not assume that the respondents can interpret the statements properly as originally formulated, all the items had to be translated and checked by several subject matter experts. The items were revised twice before going live with the survey and produced more than enough completely filled out responses. However, after having allocated every hospital to a research team member, every team member was, to some degree free to develop his own way of contacting potential respondents. Even though there was some coordination between the team members by checking in with each other from time to time, everyone maintained different ways of working. This could have been managed better by, for instance, making more use of a centralized repository for standard communication scripts. At an rate, there were very few complaints about the survey itself and the total response was nonetheless very good.

Finally, the work of Hair Jr et al. (2016), in combination with several online sources, helped considerably to understand how the analyses used in this research work. Thanks to these guides, the

statements concerning the results could be made with much more certainty. Moreover, all of the results confirmed the expectations set out in the hypotheses, which made writing the final sections relatively easy. The only part of the research that produced a slight problem in a late stage, was the specification of the constructs being reflective or formative. Only when the results were produced by the analysis software, did it become clear that the initial specification was based on assumptions of the author, after which the relevant literature was looked up (Jarvis et al., 2003) and the model specification was substantiated properly. This resulted on some rework, but no great delays.

Addendum 1: search queries

Search query 1

Using the research questions as input, two search queries were made. The first looks for articles that focus on direct effects of ITC or PKP on PA. With Boolean operators, the query is formulated as follows:

"IT capabilities" OR "absorptive capacity" AND "agility" AND "dynamic capabilities"

The results were filtered for articles released between 2009 and 2019. Also, the query was adjusted to look for articles published by the 'Basket of eight' journals. The query used on the Open Universiteit quick search was as follows:

("IT capabilities" OR "absorptive capacity" AND "agility" AND "dynamic capabilities") AND (PublicationTitle:("European Journal of Information Systems" OR "Information Systems Journal" OR "Information Systems Research" OR " Journal of Management Information Systems " OR "Journal of Information Technology" OR "Journal of Management Information Systems" OR "Journal of Strategic Information Systems" OR "MIS Quarterly"))

The query used on Google Scholar had to be executed for every separate journal as this search engine does not allow for a sufficiently large query to execute at once. The following queries were executed:

- "IT capabilities" OR "absorptive capacity" AND "agility" AND "dynamic capabilities" source:"European Journal of Information Systems"
- "IT capabilities" OR "absorptive capacity" AND "agility" AND "dynamic capabilities" source:"Information Systems Journal"
- "IT capabilities" OR "absorptive capacity" AND "agility" AND "dynamic capabilities" source:"Information Systems Research"
- "IT capabilities" OR "absorptive capacity" AND "agility" AND "dynamic capabilities" source:"Journal of the Association for Information Systems"
- "IT capabilities" OR "absorptive capacity" AND "agility" AND "dynamic capabilities" source:"Journal of Information Technology"
- "IT capabilities" OR "absorptive capacity" AND "agility" AND "dynamic capabilities" source:"Journal of Management Information Systems"
- "IT capabilities" OR "absorptive capacity" AND "agility" AND "dynamic capabilities" source:"Journal of Strategic Information Systems"
- "IT capabilities" OR "absorptive capacity" AND "agility" AND "dynamic capabilities" source:"MIS Quarterly"

Search query 2

The second query looks for articles that focus on the effect of ITC on PKP. This query was added because the first query did not yield enough results concerning this relation. For this query, the 'Basket of eight' filtering was removed in order to look through other journals as well. With Boolean operators, the query is formulated as follows:

"IT capabilities" AND "absorptive capacity" AND "external information" AND "dynamic capabilities"

The results were filtered for articles released between 2009 and 2019. The quick search engine of the Open Universiteit as well as Google Scholar were queried using the statement as shown above.

Addendum 2: measurement instrument

The following survey was used to gather the data for this research. Tables 1 and 2 show the questions as used in the survey, in Dutch. Tables 3 and 4 show the translated questions in English. Note that the questions for control variables were created in Dutch, so table 3 shows the literal translation, whereas 4 shows the items and questions from the original studies.

Table 1 Control variables - Dutch

Code	Question	Possible answers
A1	1. Geef aan hoeveel artsen (fte) werkzaam zijn binnen uw afdeling (met arts wordt bedoeld medewerker met minimaal kwalificatie basisarts)	Open vraag
A2	2. Geef aan hoeveel medewerkers (fte) in totaal werkzaam zijn binnen uw afdeling (inclusief ondersteunend en administratief)	Open vraag
A3	3. Geef het type ziekenhuis aan waar u werkzaam bent:	Universitair Medisch Centrum (UMC) Samenwerkend Topklinisch opleidingsZiekenhuis (STZ) Samenwerkend Algemeen Ziekenhuis (SAZ) Overig Algemeen Ziekenhuis (OAZ) Anders, namelijk:
A4	4. Geef het specialisme van uw afdeling aan	Algemene Inwendige Geneeskunde Anesthesiologie Apotheek Cardiologie Cardiothoracale Chirurgie Chirurgie Dermatologie Endocrinologie Geriatrie Infectieziekten Intensive Care Volwassenen Keel-, neus- en oorziekten Kindergeneeskunde Neonatologie Kl. Immunologie & Reumatologie Klinische Hematologie Klinische Oncologie Longziekten Maag-, darm en leverziekten Mondziekten-kaakchirurgie/Ziekenhuistandheelkunde Neurochirurgie Neurologie Nierziekten Oogheelkunde Orthopedie Plastische en Reconstructieve chirurgie Psychiatrie Revalidatie Spoedeisende hulp Urologie Vasculaire geneeskunde Verloskunde/Gynaecologie Anders, namelijk:
A5	5. Geef aan hoelang uw afdeling al bestaat in haar huidige vorm.	0–5 jaar 6–10 jaar 11–20 jaar 20–25 jaar 25+ jaar

A6	6. Geef aan hoeveel jaar u op uw huidige afdeling werkt.	0–5 jaar 6–10 jaar 11–20 jaar 20–25 jaar 25+ jaar
A7	7. Hoeveel jaar werkervaring heeft u na het afronden van uw opleiding als basisarts?	0–5 jaar 6–10 jaar 11–20 jaar 20–25 jaar 25+ jaar
A8	8. Geef het aantal patiënten aan dat uw afdeling jaarlijks bezoekt.	< 4000 4000 – 6500 6500 – 9000 9000 – 11500 11500 – 14000 > 14000
A9	9. Onze afdeling richt zich primair op:	Verzekerbare zorg Niet-verzekerbare zorg Allebei (ongeveer evenveel)
A10	10. Geef uw huidige functie binnen de organisatie aan:	Afdelingshoofd Chef de Clinique Arts (Specialist) AIOS ANIOS Manager bedrijfsvoering Anders, namelijk:

Table 2 measurement model items - Dutch

Code	Construct / items
ITC	**IT Capability** De aanwezigheid van IT vaardigheden en kennis kan zich uiten in de manier waarop IT middelen worden gebruikt en/of de mate waarin men begrijpt hoe IT middelen gebruikt kunnen worden binnen de organisatie/afdeling. (Chakravarty et al., 2013; Fink, 2011) Geef aan in welke mate u het eens bent met de onderstaande stellingen omtrent de vaardigheden van de afdeling (1 – sterk mee oneens 7 – sterk mee eens)
ITC_1	Wij gebruiken IT systemen op adequate wijze
ITC_2	Wij zijn op de hoogte van relevante IT ontwikkelingen
ITC_3	Ons gebruik van IT is vergelijkbaar met de beste organisaties /afdelingen in de sector
ITC_4	Wij investeren veel in de ontwikkeling onze medewerkers op het gebied van IT-gebruik
ITC_5	Wij kennen de voordelen van het gebruik van IT systemen
PKP	**Patient Knowledge Processes** Patient knowledge processes zijn processen die gericht zijn op het begrijpen van de behoeftes van de patiënten ten behoeve van de zorgverlening.(Jayachandran et al., 2004; Wu & Hu, 2012) Geef aan in welke mate u het eens bent met de onderstaande stellingen omtrent de vaardigheden van de afdeling (1 – sterk mee oneens 7 – sterk mee eens)
PKP_1	We overleggen regelmatig met onze patiënten om huidige en toekomstige behoeften voor nieuwe zorgdiensten te bespreken
PKP_2	De kennis over de patiënt zijn/haar behoeften is grondig
PKP_3	We verwerken en analyseren patiëntdata en -informatie op systematische wijze
PKP_4	We bestuderen de vraag naar de ontwikkeling van nieuwe zorgdiensten vanuit patiënten regelmatig

PKP_5	We hebben regelmatig overleg met andere afdelingen om de patiëntbehoeften te bespreken
PKP_6	Onze afdeling besteedt tijd aan het bespreken van de toekomstige behoeften vanuit de patiënt met andere (klinische) afdelingen
PA	**Patient Agility** Patient agility is de mate waarin een afdeling in staat is veranderingen in de behoefte van patiënten te signaleren en de snelheid waarmee hier op gereageerd kan worden. (Bradley et al., 2012; Jayachandran et al., 2004; Roberts & Grover, 2012a) Geef aan in welke mate u het eens bent met de onderstaande stellingen omtrent de vaardigheden van de afdeling (1 – sterk mee oneens 7 – sterk mee eens)
PA_S_1	We proberen continu aanvullende, onbewuste behoeften van onze patiënten te ontdekken
PA_S_2	We gebruiken historische gegevens om vooruit te kijken en toekomstige behoeften van patiënten in te schatten.
PA_S_3	We proberen continu de behoeften vanuit patiënten te anticiperen zelfs voordat zij zich bewust zijn van deze behoeften.
PA_S_4	We proberen nieuwe werkwijzen te ontwikkelen om te kijken naar de patiënten en hun behoeften.
PA_S_5	We signaleren behoeften van patiënten voordat zij zich bewust zijn van deze behoeften.
PA_R_1	We reageren snel op het moment dat er iets belangrijks gebeurt omtrent onze patiënten.
PA_R_2	We implementeren nieuwe en geplande geplande zorgactiviteiten omtrent onze patiënten snel
PA_R_3	We reageren snel op fundamentele veranderingen omtrent onze patiënten
PA_R_4	Als een nieuwe zorgbehoefte van een patiënt wordt gesignaleerd dan reageren wij daar snel op.
PA_R_5	Wij reageren snel op veranderingen in de zorgbehoeften van onze patiënt

Table 3 Control variables - English

Code	Question	Possible answers
A1	1. Please indicate how many doctors (fte) work in your department.	Open question
A2	2. Please indicate the total size-class of your department. (total fte including support and secretary staff)	Open question
A3	3. Please select your hospital type:	University Medical Center (UMC) Top Clinical Training Hospital (STZ) Cooperating General Hospital (SAZ) Other General Hospital (OAZ) Other:
A4	4. Please indicate your department (type)	General Internal Medicine Anesthesiology Pharmacy Cardiology Cardiothoracic surgery Surgery Dermatology Endocrinology Geriatrics Infectious diseases Intensive Care Adults Ear, nose and throat diseases Pediatrics Neonatology Clinical immunology & Rheumatology Clinical Hematology Clinical Oncology Lung diseases Gastrointestinal and liver diseases Oral diseases, dental surgery and hospital dentistry Neurosurgery Neurology Kidney diseases

		Ophthalmology Orthopedics Plastic and Reconstructive surgery Psychiatry Revalidation First aid Urology Vascular medicine Obstetrics / Gynecology Other:
A5	5. Please indicate the age of your department	0–5 years 6–10 years 11–20 years 20–25 years Over 25 years
A6	6. Please indicate the amount of your working experience	0–5 years 6–10 years 11–20 years 20–25 years Over 25 years
A7	7. How many years of work experience do you have after completing your training as a medical doctor?	0–5 years 6–10 years 11–20 years 20–25 years Over 25 years
A8	8. Please indicate the amount of patients your departments sees annually	< 4000 4000 – 6500 6500 – 9000 9000 – 11500 11500 – 14000 > 14000
A9	9. Our department primarily focuses on:	Insurable care Non-insurable care Both
A10	10. Please indicate your current function within the organization:	Head of department Chef de Clinique Doctor (specialist) Doctor in training to become a specialist (ANIOS) Doctor not in training to become a specialist (ANIOS) Business manager Other

Table 4 measurement model items - English

Code	Construct / items
ITC	**IT Capability** We define IT capability as the understanding of and technical proficiency for leveraging IT systems. Hence, IT capability offer a measure of a firm's technical and management skills and IT practices (Chakravarty et al., 2013; Fink, 2011). Indicate the degree to which you agree or disagree with the following statements about whether the department can (1 – strongly disagree 7 – strongly agree)
ITC_1	We have strong technical IT skills
ITC_2	We have adequate knowledge about IT
ITC_3	Our IT skills are comparable with the best in the industry
ITC_4	We invest heavily in our IT human resources
ITC_5	We have a good understanding of the possible benefits of IT applications.

PKP	**Patient Knowledge Processes** We define this capability as the departments' ability to generate, analyze, and disseminate patient-related information for the purpose of strategy development and implementation (Jayachandran et al., 2004; Wu & Hu, 2012). Indicate the degree to which you agree or disagree with the following statements about whether the department can (1 – strongly disagree 7 – strongly agree)
PKP_1	We regularly meet patients to learn about their current and potential needs for new health services
PKP_2	Our knowledge of patients' needs is thorough
PKP_3	We systematically process and analyze patient data and information
PKP_4	We regularly study our patient's needs for new health service development
PKP_5	We have interdepartmental meetings regularly to discuss patient's needs
PKP_6	Our department spend time discussing patient's future needs with other (clinical) departments
PA	**Patient Agility** Patient agility is defined as the degree to which the department is able to *sense* and *respond* quickly to patient-based opportunities for innovation and competitive action (Bradley et al., 2012; Jayachandran et al., 2004; Roberts & Grover, 2012a). Indicate the degree to which you agree or disagree with the following statements about whether the department can (1 – strongly disagree 7 – strongly agree)
PA_S_1	We continuously try to discover additional needs of our patients of which they are unaware.
PA_S_2	We extrapolate key trends to gain insight into what patients in a current market will need in the future.
PA_S_3	We continuously try to anticipate our patients' needs even before they are aware of them.
PA_S_4	We attempt to develop new ways of looking at patients and their needs
PA_S_5	We sense our patient's needs even before they are aware of them.
PA_R_1	We respond rapidly if something important happens with regard to our patients.
PA_R_2	We quickly implement our planned activities with regard to patients
PA_R_3	We quickly react to fundamental changes with regard to our patients
PA_R_4	When we identify a new patient need, we are quick to respond to it.
PA_R_5	We are fast to respond to changes in our patient's health service needs

Addendum 3: dataset

Table 1 shows the dataset of the control variables. Note that the response id's jump from 10 to 5. This is because in total, two servers were used to carry out the survey. The initial server (showing the first four completed responses) only provided unencrypted communication over HTTP. After the survey administrator noticed this, he requested an upgraded server that provided encrypted communication over HTTPS.

Table 1 control variables

Question code	A1	A2	A3	A3[other]	A4	A4[other]	A5	A6	A7	A8	A9	A10	A10[other]
Response id 1	38	250	A2		32		A5	A3	A3	A5	A1	A3	
Response id 3	60	250	A2		23		A1	A3	A3	A5	A1	A3	
Response id 9	4,5	32	A3		32		A1	A1	A3	A3	A1	-oth-	vakgroepvoorzitter
Response id 10	14	200	A1		10		A5	A1	A1	A6	A1	A4	
Response id 5	18	60	A1		24		A5	A3	A4	A6	A1	A2	
Response id 15	22	105	A2		-oth-	Radiologie	A2	A1	A6	A6	A1	-oth-	adviseur capaciteitsmanagement
Response id 18	1	1	A1		3		A5	A2	A2	A2	A3	A1	
Response id 28	45	840	A1		-oth-	beeldvorming , apotheek en laboratoria	A2	A1	A6	A6	A1	A6	
Response id 29	13	100	A3		-oth-	Medische Beeldvorming	A5	A5	A6	A6	A1	-oth-	Technisch Coördinator
Response id 30	36	500	A2		32		A1	A3	A5	A6	A1	A3	
Response id 31	9	50	A2		19		A1	A1	A6	A4	A1	-oth-	Teamleider
Response id 33	20	110	A2		25		A2	A3	A5	A4	A1	A3	
Response id 34	6	27	A2		30		A2	A1	A6	A2	A1	A1	
Response id 35	6,7	26,3	A4		13		A3	A1	A6	A2	A1	A1	
Response id 37	8	72	A2		18		A5	A1	A6	A2	A1	A1	
Response id 39	17	80,6	A2		21		A3	A1	A6	A2	A3	A1	
Response id 43	20	100	A1		2		A5	A3	A3	A3	A1	A3	
Response id 44	11,6	12	A1		-oth-	allergologie klinische immunologie	A1	A1	A2	A3	A1	A3	
Response id 47	15	250	A1		27		A3	A3	A4	A1	A1	A1	
Response id 49	15	20	A1		13		A3	A4	A5	A1	A3	-oth-	Onderafdelingshoofd

Response id 51	40	60	A1		22		A5	A5	A5	A3	A1	A1	
Response id 52	23	50	A1		21		A3	A3	A5	A1	A1	A1	
Response id 54	20	100	-oth-	instituut	-oth-	radiologie	A5	A3	A6	A6	A1	-oth-	teamleider
Response id 55	150	800	A1		13		A1	A1	A3	A6	A1	A1	
Response id 56	120	250	A2		-oth-	OK centrum	A3	A1	A6	A5	A1	A1	
Response id 59	12	43	A1		7		A1	A2	A3	A3	A1	A1	
Response id 60	14	84	A1		19		A5	A2	A6	A4	A1	A6	
Response id 61	35	65	A1		22		A5	A1	A6	A1	A1	-oth-	organisatorisch manager
Response id 63	4	5	A1		23		A2	A3	A3	A2	A1	-oth-	leider onderzoeksgroep
Response id 66	20	110	A1		31		A3	A3	A3	A1	A1	A1	
Response id 71	30	106	A2		-oth-	En neonatologie samen	A2	A2	A6	A3	A1	A1	
Response id 74	14	36	A2		32		A2	A1	A6	A6	A1	A1	
Response id 77	18	200	A1		19		A5	A5	A5	A3	A1	A1	
Response id 79	15	25	A1		30		A4	A1	A5	A2	A1	A1	
Response id 80	28	130	A2		13		A3	A3	A3	A5	A1	A1	
Response id 81	500	3500	A4		-oth-	Financien & Control	A1	A1	A6	A6	A1	-oth-	beleidsadviseur
Response id 87	22	125	A2		11		A3	A4	A6	A1	A1	-oth-	Meewerkend teamleidinggevende
Response id 89	11	42	A2		15		A5	A3	A3	A3	A1	-oth-	Decaan wetenschap en specialist
Response id 90	40	0	A1		11		A2	A1	A3	A2	A1	A3	
Response id 91	0	40	A1		4		A4	A2	A6	A2	A1	-oth-	verpleegkundig specialist
Response id 93	60	120	A2		-oth-	OK	A5	A5	A6	A2	A1	A1	
Response id 97	5	50	A1		13		A4	A1	A6	A1	A1	A6	
Response id 99	23	57	A1		23		A3	A3	A4	A2	A1	A2	
Response id 102	16	60	A1		5		A1	A3	A6	A1	A1	-oth-	Teamleider OK
Response id 103	0	42	A1		-oth-	Psychosociale Zorg	A2	A2	A6	A1	A2	-oth-	psychologisch sectormanager
Response id 104	0	80	A2		-oth-	Paramedici zorg	A2	A2	A6	A4	A1	A1	
Response id 106	12	85	A2		4		A4	A1	A6	A6	A1	A1	
Response id 107	4,41	52,58	-oth-	revalidatiecentrum	-oth-	kinderrevalidatie	A1	A1	A6	A1	A1	A6	

Response id 108	0	0	A2		14		A2	A2	A6	A1	A1	-oth-	Teamleider
Response id 110	20	115	A3		32		A3	A1	A6	A5	A1	A1	
Response id 111	1,22	29	A2		6		A1	A1	A6	A2	A1	A1	
Response id 112	30	175	A2		11		A5	A2	A6	A1	A1	A1	
Response id 113	38	170	A2		11		A3	A2	A3	A1	A1	A3	
Response id 115	20	100	A2		32		A3	A1	A2	A4	A1	A4	
Response id 116	20	150	A2		11		A3	A1	A2	A1	A1	A3	
Response id 117	150	600	A3		-oth-	klinische zorg	A5	A1	A6	A4	A1	A6	
Response id 119	0	135	A4		-oth-	Operatieafdeling / Endoscopieafdeling / CSA / poli anesthesie	A1	A1	A6	A6	A1	A1	
Response id 121	13	150	A4		-oth-	Medische Beeldvorming	A1	A1	A6	A6	A1	A6	
Response id 125	21	50	A1		30		A5	A1	A2	A3	A1	A4	
Response id 129	18	50	A2		25		A2	A1	A2	A2	A1	A3	
Response id 130	35	60	A3		6		A5	A1	A1	A3	A1	A3	
Response id 131	48	88	A1		6		A5	A1	A1	A3	A1	A4	
Response id 135	150	900	A1		13		A1	A2	A3	A6	A1	A1	
Response id 136	100	400	A1		32		A1	A3	A3	A6	A1	A1	
Response id 137	12	62	A2		-oth-	Radiotherapie	A5	A1	A6	A1	A1	A6	
Response id 138	45	60	A2		2		A3	A4	A5	A6	A1	A3	
Response id 142	50	250	A2		6		A5	A2	A4	A6	A1	A3	
Response id 143	17	30	A1		5		A3	A1	A5	A1	A1	A1	
Response id 144	13	82	A4		4		A1	A1	A6	A5	A1	A6	
Response id 146	56	457	A2		4		A5	A5	A5	A6	A1	A1	
Response id 147	15	35	A1		17		A4	A2	A5	A1	A1	A1	
Response id 148	25	220	A1		-oth-	cardiologie, cardiothoracale chirurgie en longgeneeskunde etage 8	A1	A3	A6	A6	A1	A6	
Response id 151	22	100	A2		32		A2	A2	A2	A1	A1	-oth-	Klinisch verloskundige
Response id 154	22	120	A2		18		A5	A4	A5	A5	A1	A3	
Response id 156	85	49	A1		-oth-	cardiologie/ thorax chir. vaat chirugie/ vasc. interne	A1	A1	A6	A6	A1	A6	

Response id 157	120	300	A2		-oth-	Okc	A5	A1	A6	A2	A1	-oth-	Anesthesiemedewerker
Response id 158	13	40	A2		2		A5	A2	A3	A6	A1	A3	
Response id 160	18	60	A3		17		A3	A1	A6	A2	A1	-oth-	Oncologieverpleegkundige
Response id 161	6	11	A3		-oth-	2 poliklinieken KNO en Oogheelkunde	A1	A1	A6	A4	A1	A1	
Response id 164	18	160	A4		-oth-	Vrouw moeder en kind (kindergeneeskunde en verloskunde)	A2	A4	A6	A6	A1	A1	
Response id 168	0	62	A3		3		A3	A1	A6	A6	A1	A1	
Response id 169	45	125	A3		-oth-	operatieamercomplex	A5	A3	A6	A4	A1	A1	
Response id 172	6	50	A4		-oth-	Radiologie en Nucleaire Geneeskunde	A5	A1	A6	A6	A1	A6	
Response id 173	0	25	A2		-oth-	Dagbehandeling	A2	A1	A6	A1	A1	A1	
Response id 175	24	40	A4		-oth-	Orthopedie, chirurgie en urologie	A2	A2	A6	A4	A1	A1	
Response id 178	15	75	A2		29		A5	A2	A6	A6	A1	-oth-	Gespecialiseerd verpleegkundige
Response id 181	35	70	A2		6		A2	A3	A4	A6	A1	A3	
Response id 182	30	50	A2		31		A1	A1	A6	A2	A1	A1	
Response id 184	0	19	A4		-oth-	Dagbehandeling	A1	A1	A6	A1	A1	A1	
Response id 185	20	24	A1		7		A5	A5	A5	A2	A1	A1	
Response id 187	8	105	A4		28		A5	A3	A2	A2	A1	A1	
Response id 191	28	100	A2		29		A1	A3	A6	A6	A1	A1	
Response id 193	10	20	A3		6		A1	A3	A4	A4	A1	-oth-	Medisch manager
Response id 196	4	40	A2		1		A1	A1	A6	A2	A1	A1	
Response id 197	18	50	A1		19		A3	A2	A3	A3	A1	A3	
Response id 199	30	250	A3		4		A1	A3	A3	A5	A1	A3	
Response id 201	6	30	A3		-oth-	Derma en expertise centum lymfologie	A4	A3	A6	A5	A1	A1	
Response id 208	11	40	A4		25		A1	A1	A2	A4	A1	A3	
Response id 211	8	40	A3		-oth-	Neuro cardio onco interne pulmo	A1	A3	A6	A1	A3	A1	
Response id 215	0	12	A1		-oth-	OK-planning en transferzorg	A2	A1	A6	A2	A1	-oth-	manager
Response id 219	8,7	80	A4		32		A2	A4	A5	A4	A1	A3	
Response id 224	35	36	A4		1		A3	A1	A6	A5	A1	A1	

Response id 225	1	1	A1		1		A1	A1	A1	A1	A1	A1	
Response id 227	25	125	A3		6		A2	A3	A4	A5	A1	A3	
Response id 230	1	1	-oth-	1	8		A4	A3	A4	A2	A2	A2	
Response id 231	10	25	A3		22		A1	A1	A6	A1	A1	A1	

Table 2 shows the dataset of the constructs.

Table 2 Constructs

Question code	ITC_1	ITC_2	ITC_3	ITC_4	ITC_5	PKP_1	PKP_2	PKP_3	PKP_4	PKP_5	PKP_6	PA_S_1	PA_S_2	PA_S_3	PA_S_4	PA_S_5	PA_R_1	PA_R_2	PA_R_3	PA_R_4	PA_R_5
Response id 1	2	3	2	3	4	3	2	4	3	3	3	4	3	3	4	3	4	5	4	5	5
Response id 3	5	5	6	4	5	3	4	2	3	2	2	3	3	2	4	4	5	6	6	6	6
Response id 9	5	3	1	2	4	5	2	2	3	1	1	1	1	1	1	1	1	3	2	3	2
Response id 10	5	4	6	4	5	4	3	4	5	3	3	4	2	5	4	4	3	3	3	3	3
Response id 5	2	3	4	4	4	3	4	3	3	4	3	3	4	3	5	4	2	2	2	2	2
Response id 15	6	5	5	5	6	4	4	4	4	4	4	4	6	4	5	4	4	5	5	4	5
Response id 18	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Response id 28	3	5	2	3	4	5	4	4	4	6	5	5	5	3	5	2	4	4	4	4	4
Response id 29	6	6	6	6	6	5	6	6	4	4	4	6	5	3	3	3	6	3	6	5	4
Response id 30	2	6	5	7	5	5	3	2	5	5	5	5	5	3	5	3	5	5	5	5	5
Response id 31	4	5	4	5	5	2	4	4	4	5	2	3	5	2	3	3	4	5	4	5	5
Response id 33	2	3	2	3	3	6	5	2	5	5	4	2	2	2	5	1	2	2	2	3	3
Response id 34	5	5	4	4	4	5	3	4	3	5	3	5	3	5	5	4	5	2	2	3	3
Response id 35	5	4	5	5	5	4	4	6	4	5	6	3	5	4	5	5	7	6	7	6	6
Response id 37	2	2	2	5	5	6	5	5	5	5	5	5	5	5	5	5	6	3	5	3	3
Response id 39	5	5	5	5	5	5	5	6	5	4	4	5	5	5	5	5	5	5	4	4	4
Response id 43	2	3	2	4	3	2	6	5	4	2	2	5	2	4	2	2	3	4	5	5	5
Response id 44	6	6	4	5	6	5	3	2	2	2	2	2	2	2	5	4	4	4	4	4	4
Response id 47	2	2	2	2	2	2	2	4	2	2	2	5	5	5	5	5	5	5	5	5	5
Response id 49	6	5	4	4	4	2	5	2	2	2	2	2	4	4	4	2	6	4	6	6	6
Response id 51	5	5	5	6	6	2	2	5	2	3	3	5	5	5	6	5	5	6	5	5	5
Response id 52	7	6	6	5	5	2	2	5	2	2	3	1	5	2	2	2	2	4	4	5	4
Response id 54	6	4	3	2	6	2	2	5	4	5	6	4	7	4	2	2	6	5	4	5	4

Response id 55	5	4	5	4	4	7	7	7	5	4	3	4	5	4	4	4	5	4	4	4	4	
Response id 56	5	5	2	2	5	3	3	5	5	5	4	2	3	3	4	3	5	2	2	3	3	
Response id 59	6	5	3	3	7	6	7	6	5	5	6	5	6	5	6	6	7	6	6	5	6	
Response id 60	4	6	5	6	5	6	5	7	6	5	2	5	4	4	6	5	4	6	7	5	6	
Response id 61	3	2	2	2	2	3	2	3	2	4	4	3	3	4	5	4	3	2	2	2	3	
Response id 63	5	3	3	6	6	4	3	2	3	3	3	5	4	6	5	4	5	5	7	7	6	
Response id 66	6	3	4	4	5	4	3	4	3	3	4	5	6	4	5	5	4	3	3	4	4	
Response id 71	6	6	6	4	6	1	5	6	5	1	2	2	3	1	5	2	1	1	2	3	2	
Response id 74	3	5	6	6	3	5	5	6	5	5	5	5	6	2	6	2	5	2	6	6	6	
Response id 77	5	5	1	2	5	2	4	1	1	1	2	2	2	2	5	2	6	2	4	6	5	
Response id 79	6	5	4	5	6	4	4	5	2	2	2	2	2	2	2	2	6	5	3	3	3	
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Response id 87	6	6	6	5	6	2	5	6	2	4	5	5	6	6	6	6	7	5	7	6	6	
Response id 89	3	6	6	2	6	5	2	5	5	5	5	5	5	5	6	6	5	5	5	5	5	
Response id 90	5	5	5	3	3	2	2	7	2	4	4	5	5	6	6	6	7	7	7	7	7	
Response id 91	6	5	6	6	6	5	7	7	6	6	5	3	6	6	6	6	5	3	6	3	3	
Response id 93	5	6	4	3	6	3	4	6	4	3	2	4	4	3	4	4	4	4	4	4	4	
Response id 97	6	6	6	7	6	6	6	5	6	6	6	7	6	6	6	5	7	6	6	6	7	
Response id 99	4	5	4	3	6	5	7	6	6	7	7	6	6	6	7	7	7	5	5	6	7	
Response id 102	2	3	2	5	3	4	4	5	4	4	4	5	5	5	5	5	5	5	5	5	5	
Response id 103	5	6	2	4	6	6	6	5	5	7	7	6	6	5	5	5	6	6	5	5	5	
Response id 104	6	3	6	4	5	4	2	5	2	7	6	4	1	4	5	4	4	4	5	5	5	
Response id 106	5	5	3	5	6	2	5	5	5	5	3	3	5	5	5	5	5	5	5	3	5	
Response id 107	5	5	2	3	6	6	2	6	5	3	3	2	2	2	5	1	7	5	6	5	5	
Response id 108	5	5	4	5	5	5	4	6	5	6	4	5	5	4	6	4	5	3	4	3	2	
Response id 110	2	5	2	2	2	5	5	5	3	3	5	5	5	5	5	5	5	5	3	3	3	
Response id 111	2	2	1	1	1	2	2	6	2	2	2	2	2	5	2	2	6	5	6	5	6	
Response id 112	3	3	2	2	7	6	2	5	1	1	5	3	2	1	1	1	7	3	7	6	7	
Response id 113	5	5	4	6	6	5	5	6	3	5	5	5	4	5	6	3	6	6	6	5	6	
Response id 115	5	5	4	2	4	5	5	3	4	4	3	2	2	2	2	2	6	5	5	5	5	
Response id 116	6	6	6	5	5	2	5	6	5	5	6	5	2	5	5	4	5	5	3	3	3	
Response id 117	5	6	4	4	5	5	4	3	4	5	5	4	4	4	4	4	5	5	5	6	6	
Response id 119	1	5	5	2	6	3	3	3	5	6	6	5	6	3	4	5	3	2	4	4	4	

Response id 121	3	5	5	4	6	5	5	6	5	3	5	6	6	6	6	5	6	6	6	6	6
Response id 125	2	2	2	2	5	3	2	3	3	4	5	2	2	2	4	2	6	2	6	6	6
Response id 129	6	4	2	3	6	5	7	7	5	7	7	7	7	7	7	7	7	5	7	6	6
Response id 130	2	2	1	4	1	1	2	2	1	2	4	2	2	2	2	1	6	4	4	6	6
Response id 131	2	2	1	4	2	6	5	5	4	2	2	3	5	2	3	5	2	2	5	2	3
Response id 135	5	4	4	4	6	7	7	7	4	4	4	7	7	5	7	4	7	2	4	3	3
Response id 136	4	4	4	6	6	6	4	6	6	6	5	5	6	5	5	4	5	5	4	4	4
Response id 137	6	5	4	5	6	1	1	3	1	1	2	2	2	1	3	2	5	6	6	6	6
Response id 138	3	2	2	2	3	2	2	2	2	2	2	2	3	2	4	2	3	2	2	3	3
Response id 142	6	5	5	7	6	5	4	5	6	5	5	4	5	5	6	2	3	3	3	4	4
Response id 143	4	6	2	2	6	5	4	5	6	4	5	2	2	2	6	4	3	3	3	2	2
Response id 144	4	3	4	2	4	4	2	5	3	2	2	1	4	1	2	1	2	2	2	2	2
Response id 146	5	6	6	6	6	6	6	6	7	6	7	6	7	5	7	5	5	5	5	5	5
Response id 147	2	3	2	5	7	4	5	1	1	2	2	6	6	5	6	4	6	6	6	6	6
Response id 148	6	6	6	6	6	5	6	6	5	4	4	6	6	6	6	7	7	7	7	7	6
Response id 151	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5	5	5	5	5
Response id 154	3	3	5	5	5	2	2	2	6	2	5	5	5	3	7	6	1	2	2	6	6
Response id 156	6	7	7	6	6	6	6	6	6	7	6	6	5	7	6	5	7	6	6	6	6
Response id 157	5	3	2	3	3	3	6	4	4	2	2	4	2	2	2	2	7	2	4	6	6
Response id 158	6	5	3	2	4	1	2	3	2	4	4	2	6	5	4	2	7	6	6	6	6
Response id 160	6	3	2	3	5	3	2	3	2	2	2	2	2	3	3	3	3	2	4	4	4
Response id 161	4	4	3	3	3	2	2	3	4	2	2	2	4	2	4	4	4	5	4	4	4
Response id 164	6	5	6	6	6	4	5	6	5	5	5	6	5	5	6	4	5	5	5	5	5
Response id 168	1	5	1	4	5	5	4	3	4	3	3	4	4	3	4	3	3	2	3	3	2
Response id 169	6	6	6	5	6	5	6	6	5	6	6	6	6	6	6	6	6	7	6	5	6
Response id 172	2	5	1	5	7	1	3	2	5	5	5	2	5	2	5	1	3	3	3	3	3
Response id 173	5	2	3	1	5	2	6	6	6	3	1	1	1	6	6	6	7	5	5	6	5
Response id 175	5	5	5	5	5	4	4	4	4	6	5	5	5	5	5	5	5	5	5	5	5
Response id 178	7	6	7	6	6	3	4	6	5	4	4	6	5	6	7	6	6	6	6	6	6
Response id 181	2	3	1	2	3	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1
Response id 182	4	2	3	2	6	5	4	6	6	4	5	4	6	4	2	3	5	4	4	4	4
Response id 184	6	5	5	6	6	6	6	6	5	6	5	6	5	6	6	6	7	5	5	6	6
Response id 185	6	6	6	6	7	4	3	6	3	5	3	3	3	3	3	4	3	3	3	3	5
Response id 187	6	6	5	5	6	6	5	6	6	6	5	4	4	5	6	5	5	4	4	5	5

Response id 191	2	6	2	3	3	2	2	2	3	3	3	4	5	5	5	4	4	4	5	5	5
Response id 193	5	5	4	6	6	5	4	5	5	5	5	6	5	5	6	4	6	5	5	5	5
Response id 196	6	6	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5	5
Response id 197	5	5	4	3	6	6	7	6	5	7	7	6	6	6	7	7	7	4	5	6	6
Response id 199	3	3	2	2	3	2	2	2	2	1	2	2	2	2	5	3	3	3	3	3	3
Response id 201	7	7	7	6	7	6	6	6	6	6	6	6	6	6	6	5	6	7	7	6	6
Response id 208	5	4	5	3	3	4	3	4	2	4	2	3	5	1	3	1	3	2	4	3	2
Response id 211	5	5	5	4	3	3	7	5	5	6	5	6	6	4	3	5	7	6	7	7	7
Response id 215	6	5	5	4	6	5	3	5	4	5	5	2	4	4	5	3	5	4	4	5	4
Response id 219	5	6	3	4	7	2	4	6	4	5	3	5	6	6	5	5	4	3	4	5	4
Response id 224	3	3	2	2	3	3	3	6	2	3	2	6	6	5	3	5	2	1	2	2	2
Response id 225	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Response id 227	6	5	6	5	6	5	6	5	5	5	5	5	6	5	5	5	5	5	5	5	5
Response id 230	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Response id 231	6	6	6	6	6	5	6	6	6	5	5	5	5	5	6	5	6	5	5	5	5
Response id 232	2	2	2	2	2	2	2	2	3	2	2	5	5	5	5	4	2	3	5	4	5
Response id 233	5	2	2	1	3	5	4	5	5	3	3	3	5	4	5	3	2	1	1	1	1

Addendum 4: factor analysis

Using the 107 responses as input, a factor analysis was carried out using SPSS version 26 to confirm whether each construct consists of one or two factors and should thus be specified as either a first or second order construct.

IT Capabilities

The construct passes the KMO and Bartlett's test, communalities after extraction are sufficient, although ITC_5 is slightly below the threshold of 0.4, which is not severe. One factor is shown to explain 49.2% of all variance, which means that this construct consists of a single factor.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,791
Bartlett's Test of Sphericity	Approx. Chi-Square	151,617
	df	10
	Sig.	,000

Communalities

	Initial	Extraction
ITC_1	,395	,441
ITC_2	,442	,544
ITC_3	,551	,644
ITC_4	,427	,464
ITC_5	,338	,369

Extraction Method: Principal Axis Factoring.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,955	59,104	59,104	2,462	49,233	49,233
2	,654	13,087	72,191			
3	,611	12,211	84,402			
4	,481	9,618	94,019			
5	,299	5,981	100,000			

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor 1
ITC_1	,664
ITC_2	,738
ITC_3	,802
ITC_4	,681
ITC_5	,607

Extraction Method: Principal Axis Factoring.[a]

a. 1 factors extracted. 6 iterations required.

Rotated Factor Matrix[a]

a. Only one factor was extracted. The solution cannot be rotated.

Patient Knowledge Processes

The construct passes the KMO and Bartlett's test, communalities after extraction are sufficient and one factor is shown to explain 52.9% of all variance, which means that this construct consists of a single factor.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,832
Bartlett's Test of Sphericity	Approx. Chi-Square	244,984
	df	15
	Sig.	,000

Communalities

	Initial	Extraction
PKP_1	,385	,412
PKP_2	,505	,520
PKP_3	,369	,412
PKP_4	,516	,587
PKP_5	,663	,658

PKP_6	,636	,591

Extraction Method: Principal Axis Factoring.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,636	60,600	60,600	3,179	52,990	52,990
2	,706	11,772	72,372			
3	,582	9,702	82,073			
4	,514	8,575	90,648			
5	,355	5,909	96,557			
6	,207	3,443	100,000			

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor 1
PKP_1	,642
PKP_2	,721
PKP_3	,642
PKP_4	,766
PKP_5	,811
PKP_6	,769

Extraction Method: Principal Axis Factoring.[a]

a. 1 factors extracted. 5 iterations required.

Rotated Factor Matrix[a]

a. Only one factor was extracted. The solution cannot be rotated.

Patient Agility

The construct passes the KMO and Bartlett's test, communalities after extraction are sufficient and one factor is shown to explain 70.4% of all variance. The resulting rotated factor matrix shows that the a priori formed first order constructs of Sensing and Responding do indeed each form a factor of their own, meaning that the second order construct of Patient Agility consists of the two factors of Sensing and Responding.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,876
Bartlett's Test of Sphericity	Approx. Chi-Square	729,552
	df	45
	Sig.	,000

Communalities

	Initial	Extraction
PA_S_1	,698	,730
PA_S_2	,529	,463
PA_S_3	,764	,797
PA_S_4	,557	,574
PA_S_5	,672	,702
PA_R_1	,690	,666
PA_R_2	,619	,611
PA_R_3	,758	,794
PA_R_4	,858	,828
PA_R_5	,879	,877

Extraction Method: Principal Axis Factoring.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5,825	58,247	58,247	5,546	55,464	55,464
2	1,774	17,741	75,988	1,496	14,958	70,421
3	,606	6,061	82,049			
4	,463	4,626	86,675			
5	,373	3,732	90,407			
6	,289	2,886	93,293			
7	,264	2,640	95,933			
8	,181	1,809	97,742			
9	,153	1,528	99,270			

10	,073	,730	100,000			

Total Variance Explained

Factor	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	3,691	36,910	36,910
2	3,351	33,511	70,421
3			
4			
5			
6			
7			
8			
9			
10			

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor	
	1	2
PA_S_1	,757	,397
PA_S_2	,595	,330
PA_S_3	,813	,370
PA_S_4	,607	,453
PA_S_5	,712	,443
PA_R_1	,777	-,249
PA_R_2	,763	-,169
PA_R_3	,792	-,407
PA_R_4	,772	-,481
PA_R_5	,821	-,451

Extraction Method: Principal Axis Factoring.[a]

a. 2 factors extracted. 6 iterations required.

Rotated Factor Matrix[a]

	Factor	
	1	2
PA_S_1	,289	,804

PA_S_2	,215	,645
PA_S_3	,348	,822
PA_S_4	,140	,745
PA_S_5	,224	,808
PA_R_1	,741	,342
PA_R_2	,676	,392
PA_R_3	,859	,236
PA_R_4	,894	,169
PA_R_5	,909	,223

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 3 iterations.

Factor Transformation Matrix

Factor	1	2
1	,736	,677
2	-,677	,736

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

Addendum 5: models used in PLS-SEM

Figure 1 shows the model used to evaluate the measurement model in PLS-SEM.

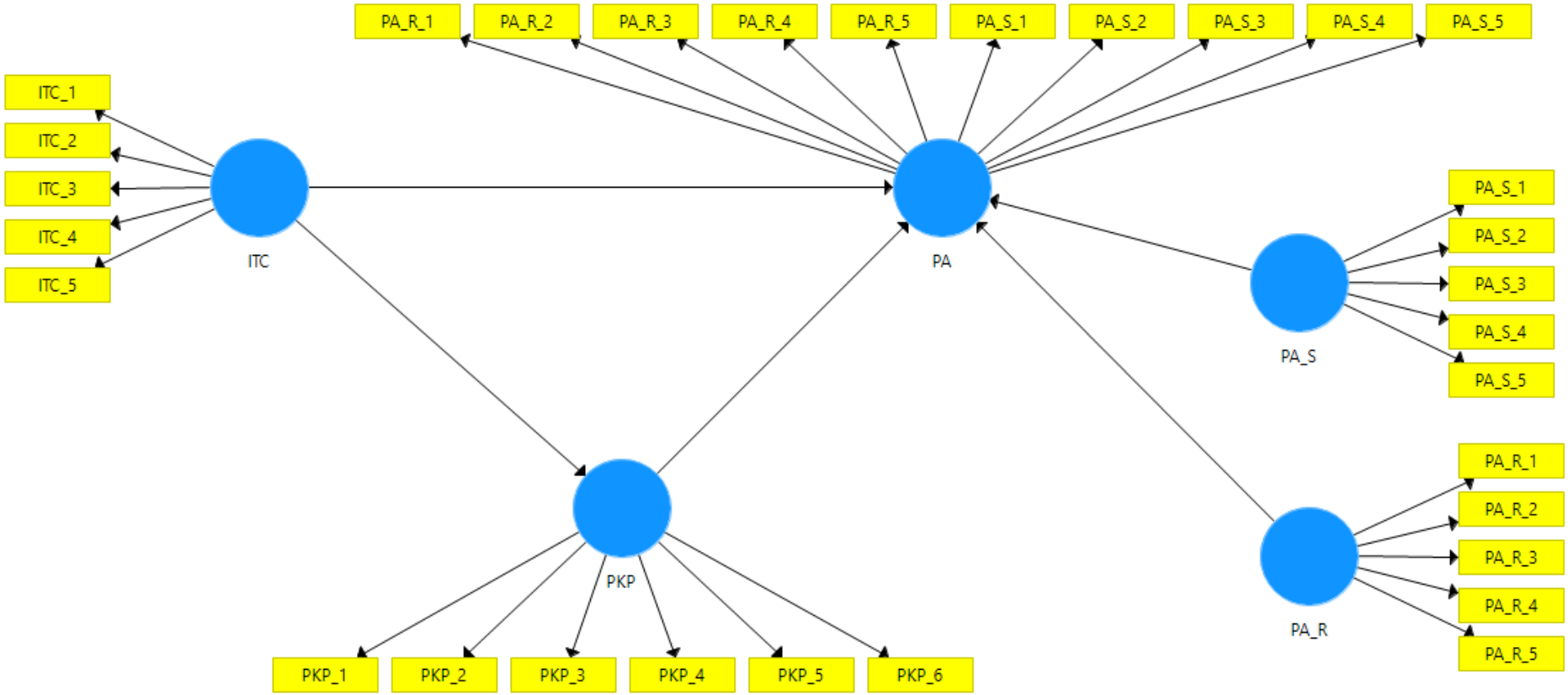

Figure 1 Measurement model evaluation

Figure 2 shows the model used to evaluate the structural model in PLS-SEM. The variables were created by exporting all latent variables computed by the PLS-SEM algorithm in the model shown in figure 1, and importing these as new variables for the model shown in figure 2.

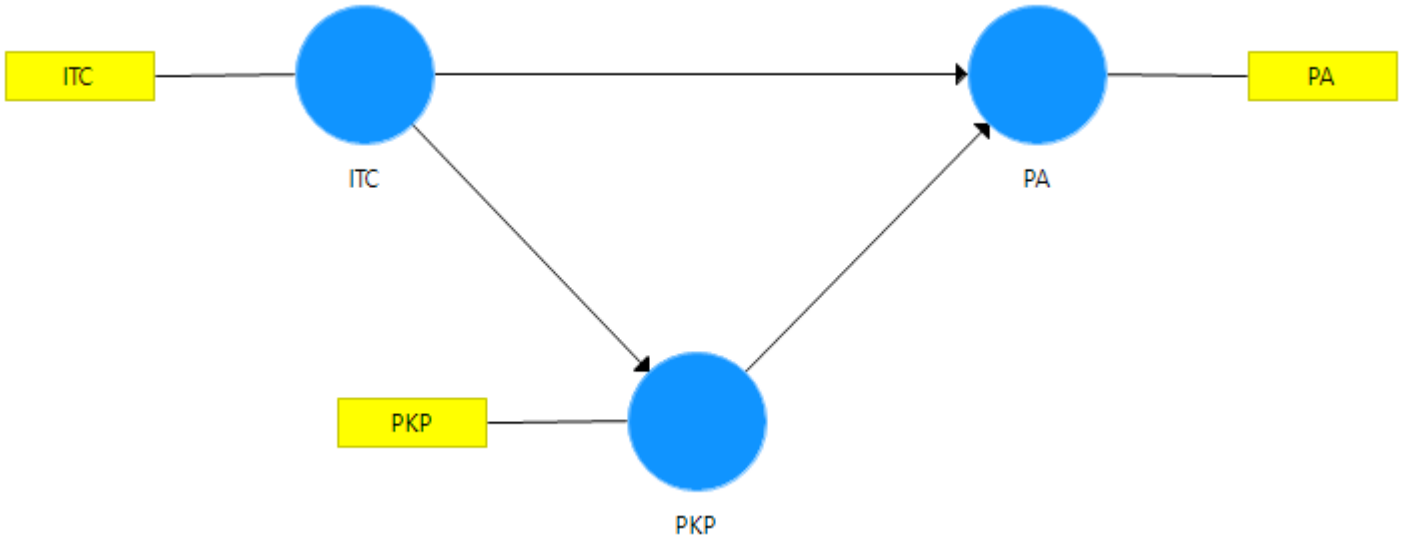

Figure 2 Structural model evaluation

References

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